Attachment 7: IBM Sustainability & Energy Solutions (Green Initiatives)

IBM Sustainability & Energy Solutions (Green Initiatives)

www.ibm.com/green

www.ibm.com/smarterplanet

www.ibm.com/think

IBM perspective and guidance on Sustainability and Energy:

IBM has been committed to environmental leadership in all of its services, enabling technology, business activities, operations, and product design for more than 37 years, since 1971. We have a clear understanding that energy efficiency is one of the most critical global environmental challenges facing the planet. Our world is connected like never before – economically, socially and technically – and the right technology to make it work smarter is available and affordable. Applying the technology appropriately is key. Smart traffic systems cut gridlock and reduce emissions. Smart healthcare systems can lower costs and improve care. Smart energy grids, water systems and supply chains will all contribute to a better world only if understand the goals and constraints of our entire community and roles.

IBM is engaged in this effort because it's what we do and who we are. We are nearly 400,000 individuals in more than 170 countries, who create and integrate hardware, software and services to enable our clients' success and make the world work better. Today, we are focused on developing a smarter planet through the infusion of intelligence into systems and processes that enable commerce, finance, transportation, electric grids and much more.

IBM has changed the way the world operates. The world is a complex system of people, processes, and technology. We understand through our experience working with local governments, utilities, and energy management systems that a collaborative open platform is important to understand and align the stakeholders. Technology alone cannot solve or sustain the performance of a Smarter Planet. From fleets to water management systems to buildings, IBM is changing how the world analyzes the processes, people and technology. IBM solutions make conservation of our energy and environmental resources a priority. IBM technology balances the strategy to operations as well as legacy processes and systems with new ground breaking innovation. For example, IBM Rational has contributed to smart metering and communications systems, replacing electro-mechanical meters with new digital meters enabling near real-time energy use and pricing information, which has become the nation's most advanced metering system and industry benchmark for buildings known to use one third of our energy consumption. It has led to energy conservation and better demand response systems that are critical to meeting our energy needs in an environmentally friendly way. Expected benefits include customer savings, green house gas reduction and reducing the need for new electric infrastructure leading to a smarter, cleaner energy future. Another example is as new hybrid vehicles become the landscape of South Florida, it is important to know that IBM helped develop innovative hydraulic hybrid technology for urban delivery trucks to optimize energy usage and reduce greenhouse gases with outcomes of 60-70% increase in fuel economy (per EPA) and 40% reduction in CO2 emissions. We have developed innovative technology for advanced telematic solutions integrated with other smart devices, vehicles and building systems for 5-10% reduction in fuel consumption and 10% reduction in telecommunications costs due to increased automation. These are just a sample of innovations IBM has participated in and contributed to for a Smarter Planet.

But IBM does not stop just with our customers' energy and environmental consumption. IBM, internally, has set substantive and effective global goals that have been documented from across all aspects of our own business including significant improvements at IBM locations within U.S. operations. IBM has completed measurement of 1.4 million square feet of client data centers worldwide. This work has uncovered 38 Million kWh of potential saving for IBM clients, the majority of which is achievable with little or no CAPEX investment.

The people of the community play a major role. IBM is committed to helping sustain and grow a dynamic engineering and technical profession to help address energy and environmental concerns by nurturing tomorrow's workforce through education outreach. For example, our Academic Initiative and STEM (Science, Technology, Engineering & Mathematics) programs are working with the University of Miami's Energy Assessment Center to help identify and lower energy consumption in much of the buildings and institutions in Florida. IBM's commitment to Miami-Dade's universities is further implemented through a collaborative research and study relationship under the multi-part LA Grid initiative that is designed to advance research, collaboration, education and talent development. We are partnering with the Florida Chamber of

Commerce, Enterprise Florida and Workforce Florida to establish programs whereby individuals, small businesses and local communities can be the chief beneficiaries of the energy and environmental programs — but only if they understand their options and are empowered to seize them. At IBM, we are looking at ways to use technology to facilitate cooperation, collaboration, competition, and to help break down the barriers to progress for the entire community. These are just a few of the innovations that will help make a Smarter City and Smarter Planet.

IBM has created a model that can be leveraged by Miami-Dade County - customized to your requirements:

Through a combination of technology, mathematics and IT, IBM will provide a Smarter Buildings Control Center solution which allows Miami-Dade County to manage energy and smarter asset usage in all of their buildings and to understand how to optimize use with respect to tenant comfort and efficiency

- A centralized and secure control system will provide the capability of adding buildings to the system at a rate determined by Miami-Dade County. As asset management on an enterprise scale and energy issues are inextricably linked – IBM will leverage smarter infrastructure technologies (instrumentation, control systems, enhanced communications, data management, and analytic and visualization capabilities) required to create systems that can adapt and interact with built, grid and environmental ecosystems and be responsive as needs change.

- Clients gain the ability to visualize dynamically how they can make a difference through integrated approach to sustainable enterprise asset management that delivers buildings using substantially less energy, cost less to operate and maintain, and lead to greater occupant satisfaction. Enables Miami-Dade County to participate in local variable rate pricing, reduced energy costs and consumption by 5 to 50% (dependant upon current state environment) and help regional systems operator balance network loads.

- The architecture of this system allows additional data to be added which will allow the optimization of other resources as water, incoming materials logistics, and to understand the interdependencies of its usage on power and other measured parameters

- The Smart Buildings Control Center provides a total system view of all resource usage and provides a detailed understanding and optimization of the interactions between these various resources and the manner in which they generate emissions.

IBM Green Sigma Offering:

IBM Green Sigma™ helps clients apply tangible metrics and technologies to reduce energy and water usage across their business
operations, including transportation systems, datacenters and IT systems, manufacturing and distribution centers, office facilities,
retail space, and research and development sites. Green Sigma™ is based on Lean Six Sigma, a strategic approach for carefully
analyzing operations to improve overall efficiency, lower costs, increase quality, and add, change or eliminate activities and processes
to improve overall performance.
IBM has extensive experience applying Lean Six Sigma principles to its operations, and currently piloting several Green Sigma™ projects
in Japan, Ireland the U.S and China. Combining IBM's experience with energy efficiency and carbon reduction, measurement and management
dashboards, and Lean Six Sigma processes, Green Sigma™ allows clients to apply this strategy to their operations and environmental
practices to:

- Manage and reduce carbon output and water inefficiencies;
- Reduce energy and water usage, and associated costs;
- Use advanced analytical techniques to establish ongoing carbon footprint and water management practices

IBM recently announced the formation of the **Green Sigma™ Coalition**. The Coalition is made up of 10 founding members who work in concert with each other and clients to supply complete solutions for measuring, monitoring and improving business processes related to energy and environment concerns. Members include ABB, Cisco, Eaton, ESS, Honeywell,

Descriptions of Some of the IBM Offerings:

Process Analytics for Public Sector Energy and Environment
Offering: Provide U.S. Government organizations with method to evaluate the current status of their Environmental, Energy and Transportation programs.
Diagnostic areas of focus:

- Environmental management system
- Energy and greenhouse gas
- Water management
- Procurement
- Waste and disposal
- Facilities and equipment
- Workforce Programs

Some areas where IBM can assist:

- Intelligent building management systems
- Development of CSR and sustainability strategies
- Strategic Carbon Management
- Carbon modeling and consulting
- Measurement & Verification
- Energy Efficiency Certificates
- Transportation Modeling
- Green Sigma Offering & Green Sigma Coalition
- Site & Facilities assessments and implementation services
- Sustainable Asset management
- Sustainable Procurement
- Business Process Management Suite
- Data Center Family of services
- Consolidation, Virtualization, Optimization services
- Servers and Storage
- Energy management software solutions
- Asset Management software
- Energy efficiency assessments IT level
- Energy efficiency assessments Facility & Data Center levels
- Distributed IT assessments (server room, server closet, PC, FAX, printing)
- Storage collection, tiering, analysis
- Site Planning
- Green sourcing and procurement consulting
- Product lifecycle management
- Workforce collaboration
- Development of CSR and Sustainability charter

IBM's Solutions for Complex Systems

IBM defines a sustainable technology support environment as an enterprise whose business processes—integrated end to end across the company and with key partners, suppliers and customers—can respond to the challenging energy and environmental challenges with flexibility and speed, market opportunity or threat. A crucial step toward becoming a sustainable business is to implement an infrastructure that is proven, open and modular. The right infrastructure can help your organization address critical environmental and technology issues, including alternative energy, energy efficiency, green house gasses and cap & trade issues along with enterprise transformation, security requirements, and regulatory compliance. It can also help you:

- Improve return on investment (ROI)

- Adopt a business-driven development approach

- Unify business, operations and support teams

• Discover, develop and deploy assets with speed and quality.

IBM recommends a customized configuration to support the federal and local requirements in a support environment that is sustainable and flexible, and can continue to offer the optimal balance of value and cost in support of changing business needs moving forward. The configuration should include requirements management, quality levels, modeling, portfolio management support, and change management, which will be determined during a collaborative workshop.

IBM Rational Design and Enterprise Architecture & Modeling

IBM Rational Design and Enterprise Architecture & Modeling can accelerate and simplify energy systems and software operations, allowing you to gain insight, predictability, and reusability in your projects. IBM Rational offers industry leading, proven software tools and processes to enhance your agile, iterative, and other projects. Organizations often use Enterprise Architecture to define their organizational goals and strategies, as well as to define the roles of a wide audience of participants and stakeholders involved in executing the tasks associated with achieving the energy efficiency, renewable energy, and green house gas goals and strategies. The definitions of strategies, tactics and roles can then be related to the underlying processes and technologies that drive operations. Clarifying these relationships can help ensure that the most important issues get the attention required for goal attainment.

- Enterprise architecture is a discipline that provides line of sight from strategic plans and direction down into:
    - The business operations that carry out the mission, goals and plans
    - The information and applications used to enable those business operations
    - The technology infrastructure that drives those applications and data resources
- Ensure your systems and software solutions deploy correctly -- first time, every time with smart tools for deployment definition and verification. With legacy systems and isolated building management packages, it is critical to orchestrate the multitude of potential point solutions to a wider enterprise strategy.
- Manage your operational and development risks and projects more effectively with a trace-ability platform that maintains and helps you analyze impacts from requirements through design into implementation.
- Jumpstart development and automate mundane tasks, with included and custom transformations, with provided authoring tools.
- Architectural analysis tools to review and manage the structure of your service-oriented applications
- Flexible model management for parallel development and architectural re-factoring that lets you split, combine, compare, and merge models and model fragments.
- A collaborative platform that seamlessly integrates with IBM® Rational® software delivery platform, including IBM Rational Team Concert, Asset Manager, Requirements Management and Change Management solutions
- Open and highly extensible

IBM Rational Method Composer

IBM Rational Method Composer is a flexible process management platform with the industry's most comprehensive tooling and richest process library to help companies combine and implement the most effective processes for successful projects.

- New collections of practices that leverage leading process expertise and experience in Agile Development, Governance and Compliance, Requirements Management, Quality Management, and Change and Release Management applicable to Sustainable systems.
- Identify needed improvements by mapping practices, that can be incrementally adopted and improved, to business objectives
- Features over 100 selectable and customizable process guidance, including RUP®, for solving common business, management, migration, implementation, or development problems
- Assess the effectiveness of practice adoption through measured results and corrective action

- Enables you to manage, author, evolve, measure and deploy effective processes tailored to your project needs with an industry-leading Eclipse-based tool

- Drives consistent results across all projects through proven best practices integrated with measurements, agile, reporting, services and project management tools

- Represents a quantum leap forward in providing IBM process solutions for software and systems development, service management and agile practices

- Provides the capability to capture and maintain your own practices and combine them with IBM's practices and processes for maximum results

IBM Rational process management solutions let you reuse objects, methods, and processes to streamline project startup, and to build confidence in estimating consistency. The IBM Rational process management solutions uniquely separate reusable core method content from process definitions. This separation maximizes your flexibility to rapidly tailor processes, packages and technologies as organizational and individual project needs dictate -- at project inception or at any time during project execution.

IBM Rational methodologies are a set of repeatable processes based on best practices surrounding portfolio management, project management, systems delivery and development, and software delivery. This framework for asset-based planning can help you guide your process engineers, program managers, facility managers, and project leads to quickly assemble and deploy optimized engagement models, project plans, and work products. Published methodologies can include skill alignments through the assignment of resource profiles, risk mitigations, and all necessary documentation to help create more consistent, higher-quality plans and to avoid reinventing the wheel.

IBM Rational Requirements

Integrated requirements management is about more than defining and managing requirements: it's about making them part of the full life cycle, tying real business needs to technology solutions and linking them directly to the business; so that the systems and software you deliver meets the real needs of business users and their energy goals.

IBM Rational Requirements Solutions are requirements management solutions that provide trace-ability and helps organizations understand the impact of change as it occurs so they can better manage risk and its effect on the project.

- Uses advanced real-time integration with Microsoft® Word to provide a familiar environment for activities such as requirements definition and organization

- Incorporates a powerful database infrastructure to facilitate requirements organization, integration, trace-ability and analysis

- Enables detailed attribute customization and filtering to maximize the informative value of each requirement

- Provides a fully functional, scalable web interface optimized for usage in a geographically distributed environment

- Provides detailed traceability views that display parent/child relationships and shows requirements that may be affected by upstream or downstream changes

- Integrates with multiple tools in the IBM Systems and Software Delivery Platform to improve accessibility, communication and traceability of requirements

IBM Rational Security

IBM Rational Web application security software helps security and IT professionals protect against the threat of attacks and data breaches. As energy and building management systems become more automated and software centric. Security becomes a priority. Involving more testers in the application security process results in higher-quality, more secure applications at a reasonable cost.

Rational offers Web application security solutions, including new Malware detection capabilities, through the IBM Rational family of products. Rational Security can be used vulnerability scanning in all stages with or without security expertise.

- Rational automates security testing, delivers comprehensive defect analysis, and offers environment-specific recommendations for fixing security flaws.

- Builds security testing into the development lifecycle to find vulnerabilities early in the process
- Uniquely combines multiple analysis techniques to ensure complete scanning coverage
- Provides intelligent fix recommendations to improve productivity
- Automates application vulnerability scanning, including automated JavaScript Execution, Auto Flash Parsing, and Web Service testing
- Designed to quickly unit test web applications within major development environments

IBM Rational Change Management

IBM® Rational's Change Management products enable teams to effectively manage the systems and software life cycle. Features such as agility, change tracking, process automation, reporting, and lifecycle traceability enable better insight, predictability, and control of systems and software. IBM Rational Change Management provides change tracking, process automation, reporting and lifecycle traceability for better visibility and control of the software lifecycle.

- Flexible, customizable and automated workflows provide repeatable, enforceable and predictable processes
- An out-of-the-box Application Lifecycle Management (ALM) template provides a solid foundation for ALM best practices
- Real-time reporting and metrics improves project visibility and decision making
- Access control, electronic signatures, repeatable processes and audit trails simplify compliance management
- Scales to fit any size team from small workgroups to distributed enterprise teams to support evolving organizational needs
- Integration with requirements, development, build, test, deployment and portfolio management tools facilitates rapid response to change

IBM Rational Quality Management

IBM Rational Quality Management allows organizations to build in quality from the beginning to look forward, innovate and pursue new energy opportunities. A mature software quality practice empowers organizations to deliver the right amount of functionality, reliability, scalability, maintainability and any other capability required to ensure success.

IBM Rational Quality Management helps find and fix errors earlier in the life cycle.

- Unit testing and debugging capabilities.
- Performance bottlenecks and visualize the execution
- Structural analysis allows architects to detect, build and maintain an inventory of design patterns and anti-patterns in order to visualize parent/child relationships and validate the architectural integrity of components and systems.
- Integration with requirements, development, build, test, deployment and portfolio management tools facilitates quality standards

IBM Rational Configuration Management

IBM® Rational® software configuration management products enable you to effectively manage and control project assets. Features such local and remote access, a proven usage model, a wide-range of supported environments, transparent access to files and parallel development support enable team members to have instant, controlled access to the project assets they need to create, update, build, reuse, and maintain.

IBM Rational's Configuration Management solutions are industry-leading solutions that provide sophisticated version control, workspace management, parallel support, and build auditing to improve productivity.

- Light-weight feature-rich clients allow you to work locally or remotely

- Flexible out-of-box usage model based on proven best practices increases team productivity and efficiency
- Wide-range of supported environments and cross-platform support connects diverse teams
- Transparent real-time access to files and directories virtually anywhere in your organization
- Scales to any size team from small workgroups to distributed enterprise teams to support evolving organizational needs
- Integration with leading IDEs allows you to work in your preferred environment
- Sophisticated branching and graphical merge tools enable concurrent access to files and efficient use of time

IBM Tivoli® Monitoring for Energy Management monitors and helps manage energy usage of IT and facility resources for efficient data center operations.

Optimize your energy consumption for higher efficiency of resources, lower operating cost, and reduced carbon emissions

•Gain insight into energy and thermal information for IT equipment, data center infrastructure and facilities equipment and enable the optimization of the monitored environment from a centralized point of control

•Leverage integration with Tivoli Business Service Manager to understand the business service impact of energy optimization decisions

•Pull energy usage information into Tivoli Usage and Accounting Manager to enable energy-related consumption and chargeback capabilities

•Use enhanced reporting capabilities to estimate the potential power and cost savings of proposed energy optimization recommendations

DataPower Network Appliance

DataPower addresses business and technology challenges for power, electricity, gas, and water networks that require security and scalability. The need for scalability is moving to millions of transactions per day followed by millions of transactions per hour.

Advanced Meter Management: fast and secure handling of meter data into supporting infrastructure

Network Automation: standards based integration of data for use in network and outage management systems

Generation fleet operations: scale to support large volumes of data from thousands of generation devices and support trading systems

Interoperability is key to integrate with existing infrastructure.

WebSphere Business Events

WebSphere Business Events is a software system designed specifically for managing the business events flowing across systems and people with the goal of providing timely insight and response. Business events are discovered and described in business terms to meet business objectives based on high-level management goals. It allows business users to detect, evaluate, and respond effectively to the impact of business events based on the discovery of actionable event patterns.

IBM ILOG Business Rule Management Systems

ILOG Business Rule Management Systems (BRMS) provide easy, safe and predictable control over automated business decisions with the right tools for business managers, analysts, architects and developers. ILOG JRules offers a complete Java business rule management system; ILOG Rules for COBOL is an ILOG JRules add-on module for mainframe COBOL applications.

Develop interactive state-of-the-art decision management applications
- Automate decisions
- Enforce individual business goals
- Relax constraints
- Conduct what-if analysis
- Provide explanations for trade-offs
- Edit and override results

Support project-based analytical services or application prototyping
- Help optimization experts explain and present their sophisticated models

Embed models and engines into existing development and application frameworks

IBM Cognos Performance solutions can help with the Energy initiative, Cognos enables organizations to:

Make Better decisions: Say goodbye to gut feel with relevant, timely and accurate information about your business performance. Integrate financial and operational data into a single source of trusted information for everyone, at every level of your organization.

Have Greater agility: Break free of spreadsheets with dynamic, driver-based planning and scenario modeling. Set and re-set targets, plans and resource allocations quickly to seize new opportunities or respond to emerging threats.

Gain Higher performance: Our proven Performance Management Framework lets you identify and optimize the sweet spots of information hidden deep within your corporate data and apply them to the decision areas that drive better results.

Cognos products
Deliver reporting, analysis and scorecards that integrate with finance-led budgeting, plans, forecasts and financial reporting.

- **Cognos 8 Business Intelligence**
- **Cognos 8 Go!**
- **Cognos Now!**
- **Cognos 8 Business Viewpoint**
- **Cognos TM1**
- **Cognos 8 Planning**
- **Cognos 8 Controller**
- **Cognos Analytic Applications**

Link to Cognos - http://www-01.ibm.com/software/data/cognos/

Hardware solutions:

IBM's energy efficient system leadership spans multiple server families including:

•IBM System x with scalability up to 96 cores to support virtualization and consolidation efforts as well as superior performance per Watt.
•BladeCenter with an energy efficient design that can meet a broad range of application, environmental, and performance requirements.
•POWER Systems with its advanced virtualization and EnergyScale technology to deliver the best performance per Watt in its category.
•System z which is designed to run at the highest utilization rates to drive virtualization and consolidation efficiencies with reduced energy costs.

IBM System Storage offerings can help you to optimize your storage infrastructure to reduce overall costs and drive green benefits. We have the broadest portfolio of disk and tape options and information lifecycle management capabilities to allow you to optimize where data resides in the tiered storage hierarchy. IBM has leadership in Storage Virtualization to help you to improve utilization and management. We can also help you to reduce the amount of data you need to store and backup with our innovative data de-duplication solutions.

IBM has experience in helping organizations achieve IT excellence with technology that is right for their requirements. We don't presume a single system approach can be forced to fit every workload need. That is why IBM's flexible choice of platforms based on specific workload requirements is a better approach.

IBM has the infrastructure technology that scales to the largest capacity in the industry. Energy management solutions incorporate new metrics into the management system to help meet "green" goals. Only IBM unites business services, IT, data centers, and facilities infrastructure for energy efficiency and provides users with the ability to match utilization to actual demand to reduce cost of data center and facility.

Getting the most from your Data Center - Services Offerings

About the IBM server services service product line

The IBM server services service product line offers a group of services that helps clients effectively assess, design, implement, and manage their computing environments by focusing on optimizing utilization, cost, availability, energy usage, security and system management of their data centers and distributed environments.

The services include:

- **IBM Server Optimization and Integration Services** -- helping clients optimize their computing environments to reduce IT infrastructure complexity, reduce energy consumption and operational management costs, while increasing availability and adaptability to facilitate business growth and change. Key services include:
  - Server consulting and technology assessments
  - Server architecture, design and planning
  - Server consolidation and virtualization
  - Server high availability solutions for System z and Open Systems.
- **IBM Server Managed Services** -- a modular set of remote and on-site services that provide clients with the skills, expertise, processes, tools and methodologies needed to help optimize the management of their server environments -- without requiring significant up-front investments or major transformation of their server environment. Key services include:
  - Remote managed infrastructure
  - Enterprise servers (custom management options).
- **IBM Server Product Services** -- helping clients shorten the time required to plan, implement and deploy new servers and software, so they can adopt new technology more quickly and speed their return on investment. Services are available for IBM Power Systems, including IBM System i ™ and IBM System p ™; IBM System x ™ , IBM System z ™ servers, non-IBM servers, and Linux and Microsoft® operating systems. Specific offerings include:
  - IBM implementation services
  - IBM migration services.

IBM storage and data services portfolio information

The IBM storage and data services service product line addresses your clients' storage and data needs from end to end-- from assessment and planning to design, implementation and management.

- **IBM Storage Optimization and Integration Services**-- helping clients reduce complexity, optimize performance and manage growth by creating cost-effective, highly utilized, scalable and resilient storage infrastructures.
- **IBM Information Lifecycle Management Services**-- helping companies gain more value from their information by managing it from creation through disposal on a more efficient storage infrastructure.
- **IBM Data Mobility Services**-- Helping clients reduce costs, minimize downtime, and satisfy critical SLA mandates by providing a simple and unified approach to moving data on-line; regardless of distance, server platform or storage array vendor.
- **IBM Storage and Data Product Services**-- helping clients reduce project risk, speed deployment and use key product functionality effectively by providing assistance with the planning, implementation and migration of storage- and data-related hardware and software products.
- **IBM Storage and Data Managed Services**-- helping clients leverage the expertise, scale and pre-integrated, standard capabilities of a world-class services provider that can manage the storage environment on their behalf.

IBM site and facilities services portfolio information

The IBM site and facilities services service product line provides expertise to assist clients with evaluating, designing, implementing and managing their IT infrastructure and physical environments. The services include:

IBM Data Center and Facilities Strategy Services -- builds on an IBM consulting methodology that determines the capacity, availability and security requirements of the client's data center facility. Through this service, we help clients mitigate operational risk, enable business continuity and align IT with business requirements, as well as help address compliance with regulatory mandates and privacy laws.

IBM IT Facilities Assessment, Design and Construction Services -- enables the creation of stable, security-rich, future-ready data centers and enterprise command center facilities. The risk and complexity associated with building a new data center or updating a facility can be minimized by capitalizing on our project experience -- experience we've acquired by building literally hundreds of data centers that we rely on every day, in addition to the long list of projects we've executed for clients around the globe.

IBM IT Facilities Consolidation and Relocation Services -- leverages IBM methodology and extensive, hands-on experience to help clients make optimal investments that deliver availability, scalability, recoverability and agility throughout their data center transitions. Our approach enables clients to minimize the inherent risk and complexity associated with migrations of their data center environments while planning for the future.

IBM Specialized Facilities Services -- includes the IT and industry knowledge essential for project design and integration relevant to intelligent building and green building construction, as well as factory automation, clean room, trading room and facility management control systems. Specialized Facilities Services provides advanced solutions and products in IT hardware, networks, control systems and subsystems. Solutions can provide global and regional support infrastructures for multinational clients.

Who to contact:

Renee Herr/Atlanta/IBM@IBMUS Office: 678-496-4564 Cell: 678-570-1318

Marty LaFond/Tampa/IBM@IBMUS Office: 813-356-4776 Cell: 813-494-8231

Information Management

IBM Cognos Solution for the American Recovery and Reinvestment Act of 2009

The American Recovery and Reinvestment Act of 2009 will funnel much needed funds to state and local governments for disbursement to support programs to create jobs and stimulate local economies. The reporting requirements go beyond what is currently required, such as USASpending.gov, by requiring agencies, contractors, and subcontractors to report all spending, and estimate the number of jobs saved or created. A key component of the Recovery Act is the strict requirement for monitoring, measuring and reporting on how the funds have been allocated, the projects those funds have supported and the results achieved by the investment of those funds, with all transactions being as transparent as possible. This will require new reporting and tracking systems across the federal government, as well as by states, localities, and contractors.

IBM Cognos is strongly positioned to deliver the most comprehensive solution that will allow for a seamless, integrated, bi-directional exchange of the data and information mandated by the American Recovery and Reinvestment Act. The value we bring to the Federal government is outlined below:

Show One Complete View of Projects, Funds, Ownership and Tracking to Completion
IBM Cognos offers the Federal government the ability to have one, complete view of all activities and budget items under the American Recovery and Reinvestment Act of 2009. IBM Cognos delivers this complete view by giving all Federal agencies, sub-agencies, and departments tasked with disbursing funds the ability to measure and monitor all activities associated to each individual project and aggregate that data at various levels and eventually to an executive view The solution provides the ability to drill down and analyze trends to identify risks and overall performance of the success and management of each project will assist in the decision making process of where to invest funds for maximum impact and to ensure successful outcomes.

Increase Accountability
IBM Cognos helps to drive a climate of accountability of the dollars inverted through the American Recovery and Reinvestment Act by aligning funds to strategic goals of the Act and ensuring that projects, budgets and requests for funds align with those strategic goals. By ensuring this alignment, IBM Cognos can assist in ensuring the investment of funds meets the desired objectives and in increasing accountability in all Economic Stimulus Program activities.

Foster a Transparent and Open Government
IBM Cognos helps your agency achieve the highest level of transparency and clarity in all programs funded through the American Recovery and Reinvestment Act of 2009 through in-depth reporting of the funds invested and the results achieved to date, available real-time as results are made available by states and municipalities.

To help the Federal government achieve this aggressive goal, IBM Cognos has developed a specific Recovery Act Transparency and Accountability Reporting solution for Federal government:

A **Central Repository** for maintaining specific American Recovery and Reinvestment Act information.
Data Collection via the Web for stimulus reporting requirements that must to be captured, with support for any level of detail (department, agency, program, state, locality, or recipient level).
Reports, Dashboards, Scorecards, Analysis, and Alerts that show how, when, and where money has been invested whether from stimulus or non-stimulus data sources, can be distributed via the web for internal or external reporting to stakeholders, and can provide citizen centric reporting as required by the American Recovery and Reinvestment Act.

Information Management

IBM

IBM Cognos Solution for the American Recovery and Reinvestment Act of 2009

The IBM Cognos Stimulus Transparency and Accountability Reporting Tool provides government with a comprehensive view of all projects funded and gives the Federal government the ability to measure and monitor activities associated to each individual project and aggregate that data at an executive level to enable better decision-making and ensure successful outcomes.

Benefits to the Federal Government:

1. **Rapid Deployment**
   IBM Cognos is prepared to deploy our solution today with a 45 day go-live target.

2. **Reporting platform to support summary and detailed level requirements**
   Solution that allows agencies to report clearly distinguish ARRA from non-ARRA funds
   ARRA funds can be tracked at any dollar amount and from summary to detailed level of recipient (i.e. Federal down to sub-contractor.)
   Can report on any data element as outlined in the OBM guidance.

3. **Single Version of the Truth**
   Eliminates redundant Excel spreadsheets through a simplistic web entry data capture at all levels of detail of ARRA funding disbursement.

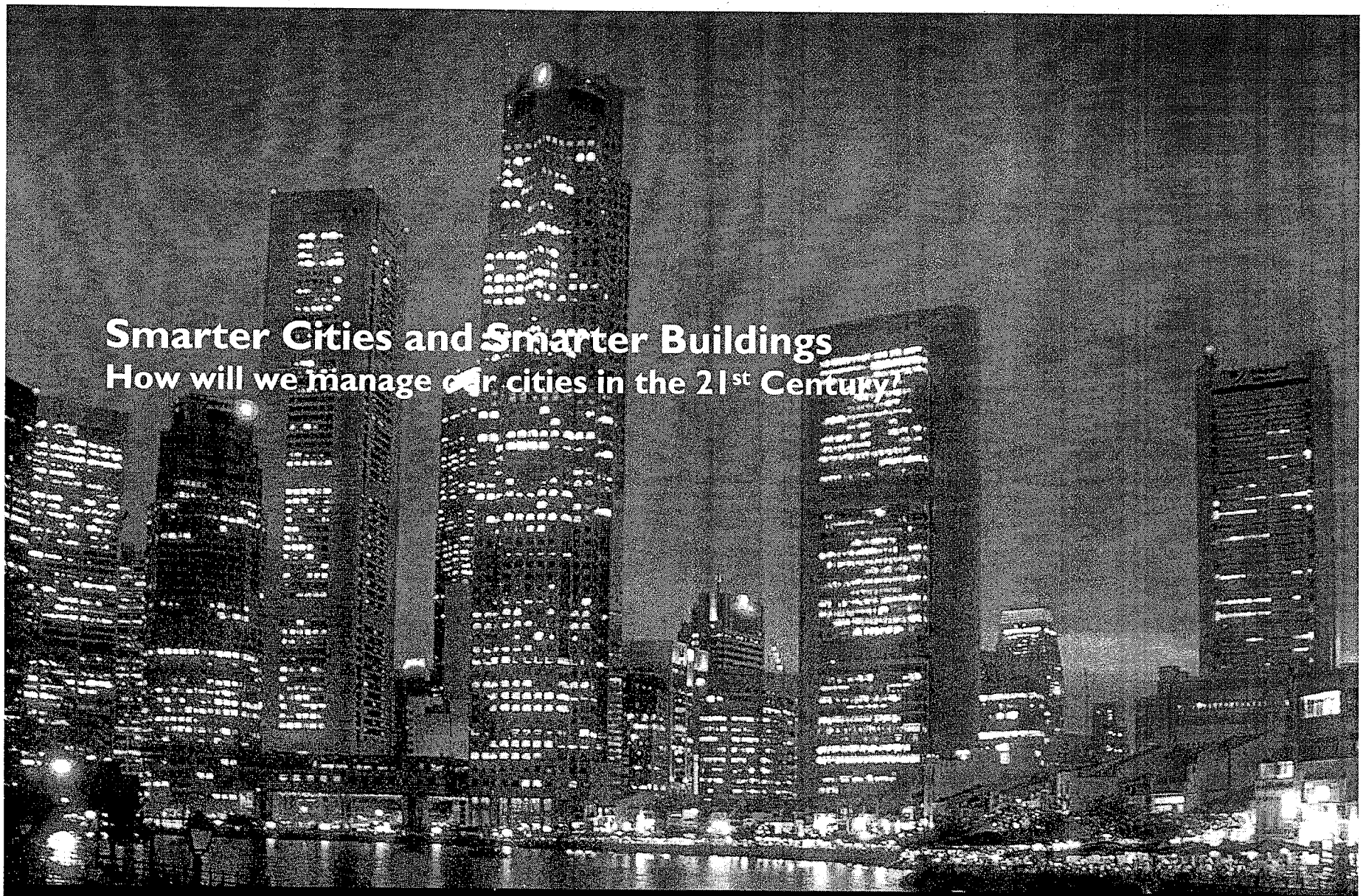
SMART Solution Highlights

- **Tracks Comprehensive Project Data for Reporting, Analysis and What-if scenario Planning:**
  - Project Name, Dollars Allocated
  - Drill down capabilities to the lowest level identifying steps of completion and ownership
  - Measure dollars spent to date with an audit trail to each dollar
  - Alarms / thresholds to ensure effective project management
- **Federal Metrics Requirements Tracking:**
  Built in flexibility to allow additional performance metrics to be added as defined by the Federal Government.
- Project Reports for Agency Websites
- Publish reports to the web for citizen centric consumption

Contact:

Rob Headley
IBM Cognos
916-261-4513
rheadley@us.ibm.com

Cognos. software



Smarter Cities and Smarter Buildings

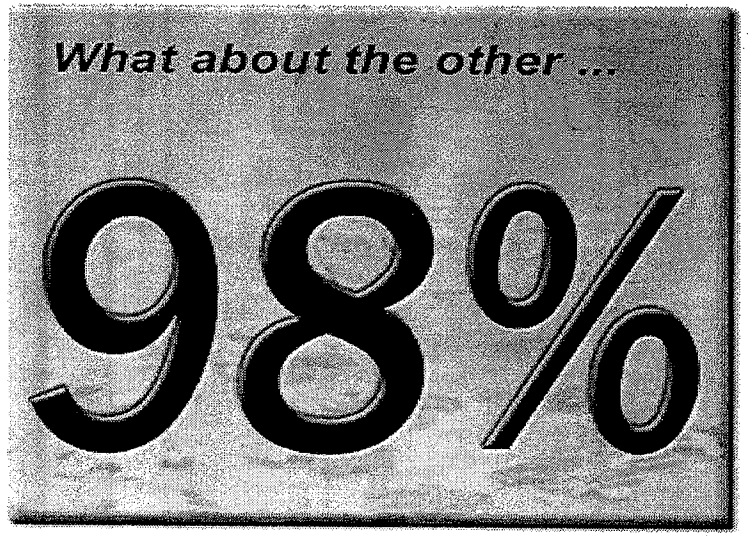
How will we manage our cities in the 21st Century?

Florence Hudson
IBM Corporate Strategy
Energy & Environment Executive

IBM

Agenda

- IBM Energy and Environment Initiatives for a Smarter Planet
- Smarter Cities
- Smarter Buildings
- Why IBM



The Bad News: **IT accounts for 2% of global CO_2 emissions**

The Good News: **IT can significantly contribute to control and reduce the 98% of CO_2 emissions caused by other activities and industries**

"... you can't make a product greener, whether it's a car, a refrigerator or a traffic system, without making it smarter — smarter materials, smarter software or smarter design." - Thomas L. Friedman

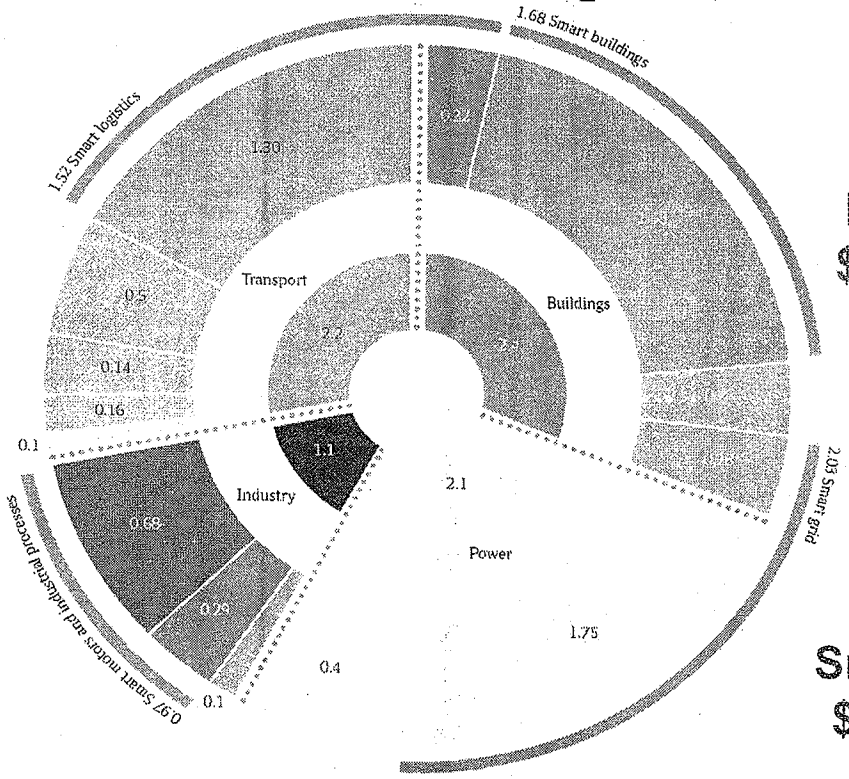
Sources: Gartner, Green IT, October 12, 2007; "The Green Road Less Traveled" by Thomas L. Friedman, The New York Times, July 15, 2007, http://select.nytimes.com/2007/07/15/opinion/15friedman.html?scp=2&sq=thomas%20l%20friedman%20july%202007%20greener%20smarter&st=cse

Tackling climate change is good for the climate and economy

Information and Communications Technology (ICT) can significantly improve energy efficiency and reduce GHG emissions, driving potentially $1 Trillion in energy savings per year by 2020 and 7.8 Gigatons CO_2e abatement

Smart Logistics: $442B/year

Smart Industrial Automation: $107B/year

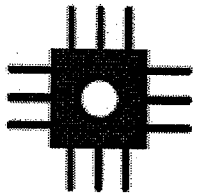


Smart Buildings: $341B/year

Smart Grids: $125B/year

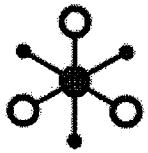
Source: The Climate Group, "Smart 2020: Enabling the Low Carbon Economy in the Information Age." 2008

Something profound is now happening with the infusion of intelligence into the way the world works



Our world is becoming

INSTRUMENTED



Our world is becoming

INTERCONNECTED

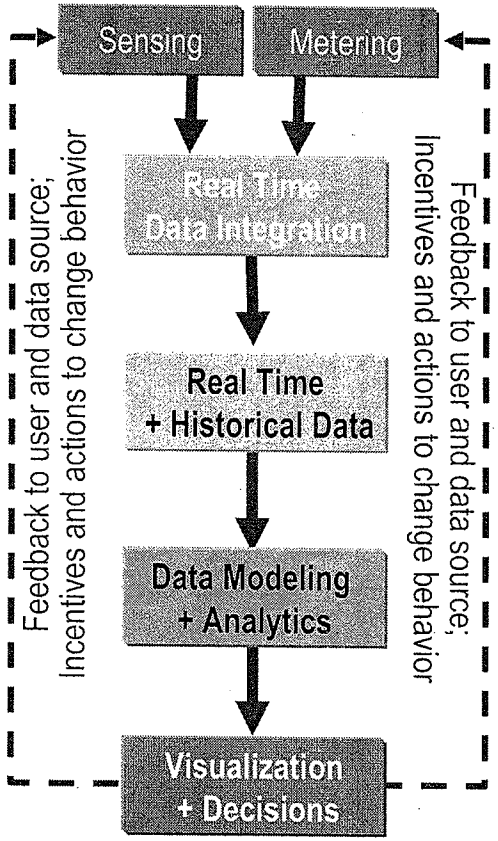
Virtually all things are becoming

INTELLIGENT

... Our planet is becoming smarter

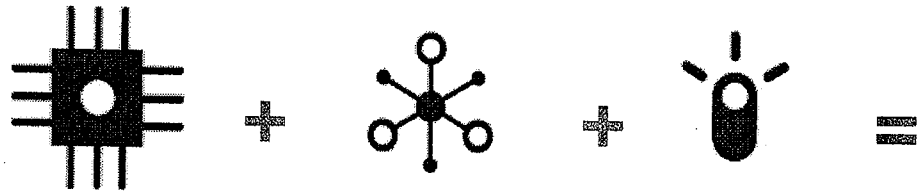
What does it mean to become Smarter?

Measuring, Monitoring, Modeling and Managing

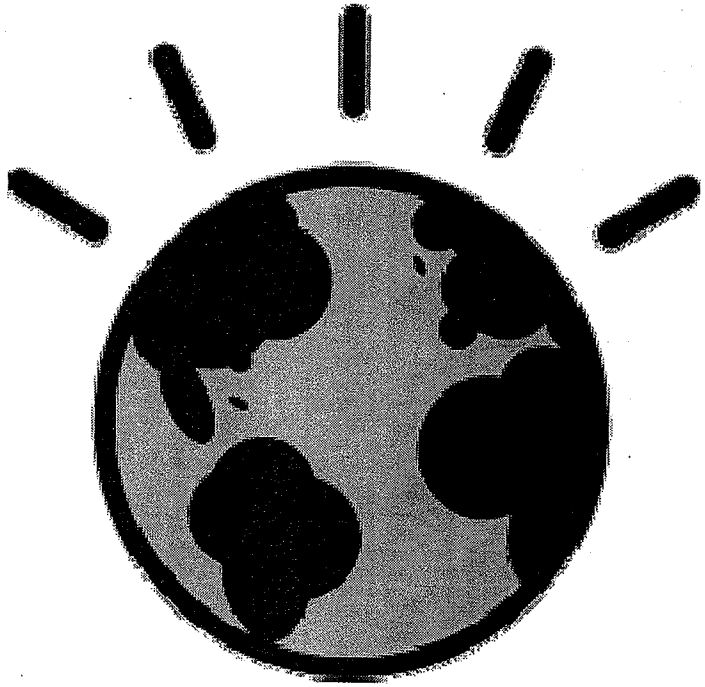


- **Data collection**
- **Data Integration**
- **Comparison of historical data, with newly collected data**
- **Data modeling and analytics to create insights from data to feed decision support and actions**

Source: IBM Corporate Strategy



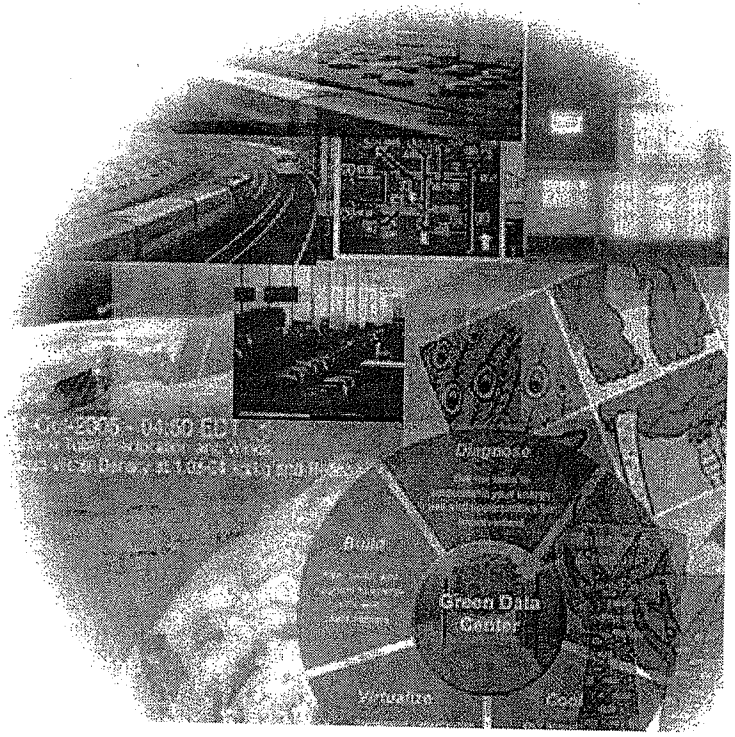
An opportunity to think and act in new ways — economically, socially and technically.



A Smarter Planet

IBM's Energy and Environment Initiatives help Build a Smarter Planet – Delivering Innovations that matter to business, government, people and the planet

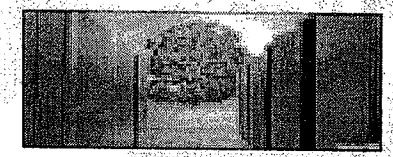
- **Energy Efficient Technologies and Services**
  - Green IT
  - Green DataCenters
- **Mobility Services**
- **Intelligent Transportation Systems**
- **Intelligent Utility Networks**
- **Advanced Water Management**
- **Sustainable Business Solutions & Services**
  - Strategy / Corporate Social Responsibility
  - Green Sigma ™
  - Green Supply Chain – Green SNOW
  - Smarter Cities
  - Smarter Buildings
  - Cap and Trade Systems
- **Alternative Energy Research**



IBM innovations address energy & environment challenges – and wherever you begin, IBM can help – ibm.com/green

Energy Efficient Technologies and Services

Green IT and Data Centers

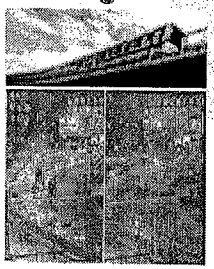


- IT and data center facilities energy efficiency
- Monitoring & verification of efficiency goals
- Energy Efficient, Virtualized, Dynamic IT/DC
- IBM and client case studies: 40% to 80% energy use reduction, up to 85% less floor space

Mobility Services

- Reduce traffic and pollution
- Retain and attract talent
- Cut facility costs/impact

Intelligent Transportation Systems



- Reduce traffic congestion
- Reduce CO_2 emissions
- Increase mass transit usage
- Improve environment
- Stockholm case study: Reduced traffic congestion 25%, Carbon emissions 15%

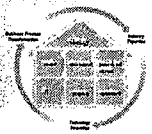
Intelligent Utility Networks

- Reduce energy usage
- Improve grid management, reduce outages
- U.S. case study: 10% energy use reduction, up to 50% reduced load on electric grid

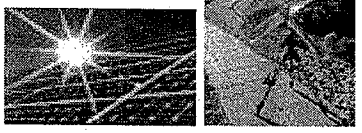
Advanced Water Management

- Flood avoidance
- Reduce water usage
- IBM case study: 27% reduced water usage, with 30% increase in manufacturing output, saving $M in energy and water cost

Sustainable Business Solutions & Services



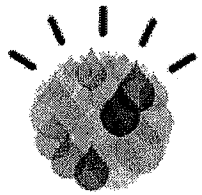
- Strategy
- Corporate Social Responsibility
- Green Sigma TM
- Business Operations/Supply Chain - SNOW
- Smarter Cities
- Smarter Buildings
- Cap and Trade Systems



Alternative Energy Research

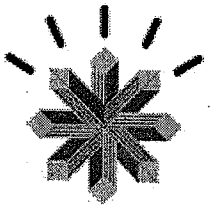
IBM know-how in thin films, semiconductors, advanced photovoltaic materials, applying IT cooling technologies to concentrator photovoltaics, IT to ET, nanomembranes for desalination, energy storage; etc.

Many of IBM's smarter planet initiatives are interconnected



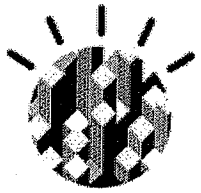
Water

Whether too much or not enough, the world needs a smarter way to think about water



Buildings

Given their environmental impact, it's time we designed from the earth up

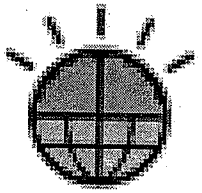


Cities

Safe neighborhoods. Quality schools. Affordable housing. Traffic that flows. It's all possible.

Oil

Get to the "first" oil faster. Increase recovery rates. Sense and solve problems before they start.

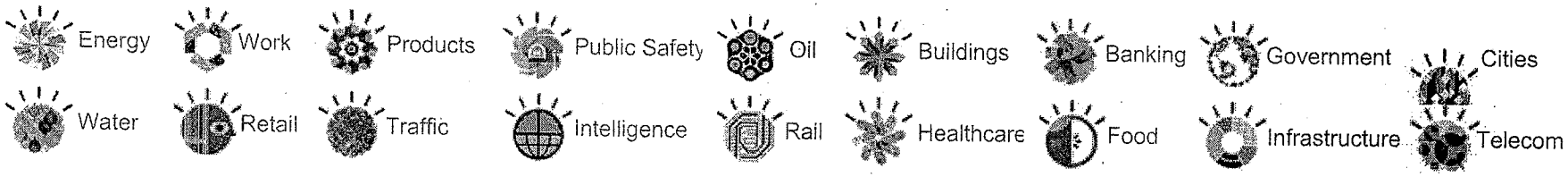


Intelligence

Smart thinking about data analysis

Traffic

How we get from point A today to point B tomorrow



Why Smart Cities? Why now?

Technological

- Convergence of pervasive digital networks, cheap sensors, cheap analytics
- There are over 4 billion mobile cellular subscribers in the world today (60% penetration)
- Location-based services and social networking continue to grow in capability and popularity
- IT has made it possible for global enterprises to operate anywhere in the world

Social/Demographic

- At the end of 2008, 50% of the world population lived in a city
- Urban population will almost double between 2010-50 (to 6.4B!)
- 18 countries in the world with contracting populations (in 2050, 44)
- Asia will become 50% urban in next 15 years
- Rapid urbanization is creating high stresses for many Asian cities, in turn driving the construction of hundreds of new cities

Economic

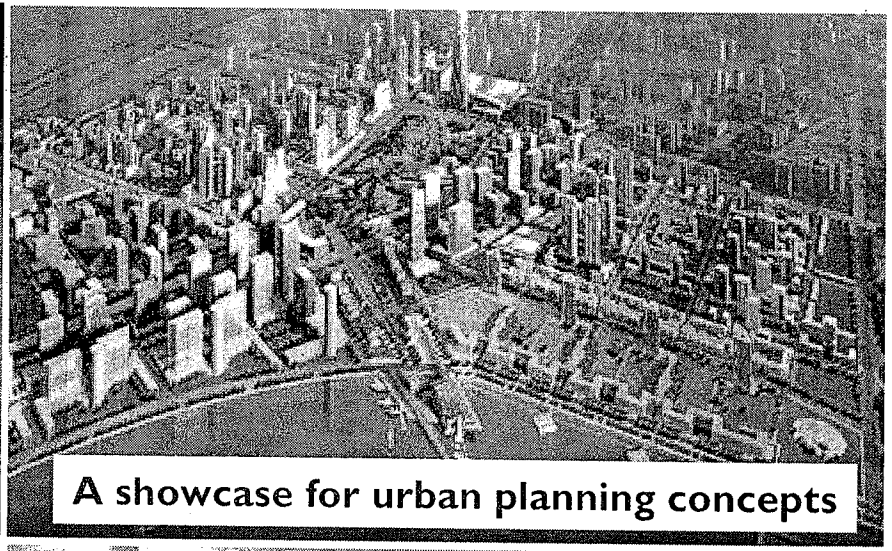
- The top 100 urban agglomerations currently account for 25% of worldwide GDP
- Developed world has underinvested in its cities; the developing world needs new urban infrastructure ($41T needed by 2030)
- Rise of "new" cities (MASDAR, New Songho City, GIFT, KAEC, etc.)
- Global financial crisis is spurring government stimulus, creating new jobs

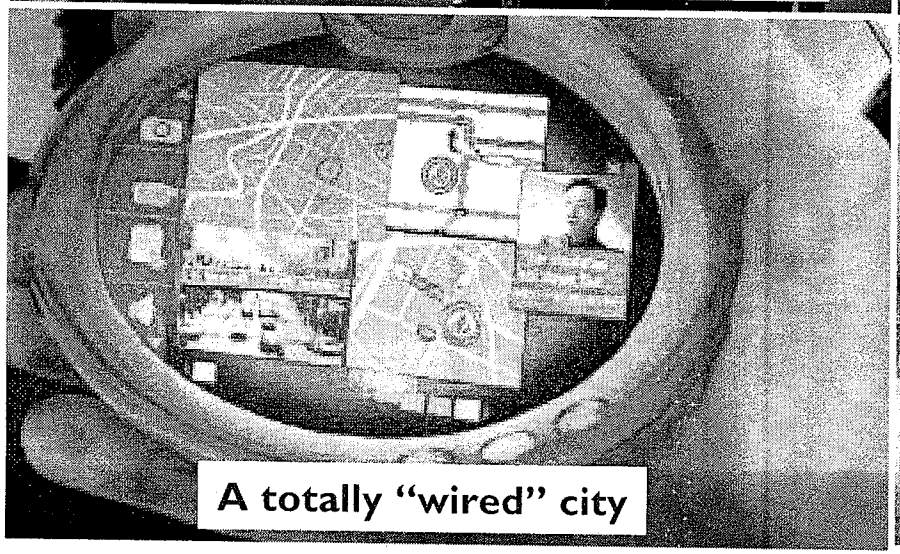
Environmental

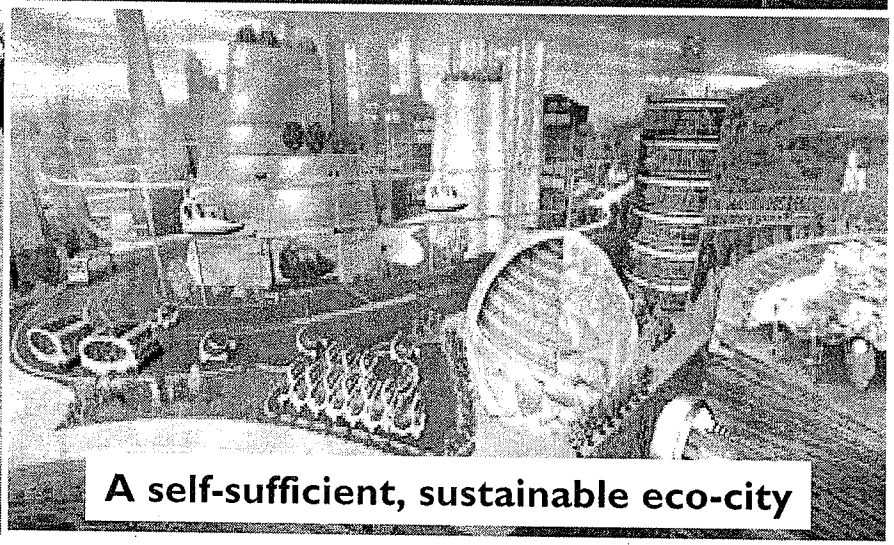
- Drive for cities to cut carbon emissions and increase the energy they get from renewable sources
- There will be 1.2 billion cars on the road by 2015 (~1 car/6 people)
- 95% of the world's cities still dump raw sewage into their waters

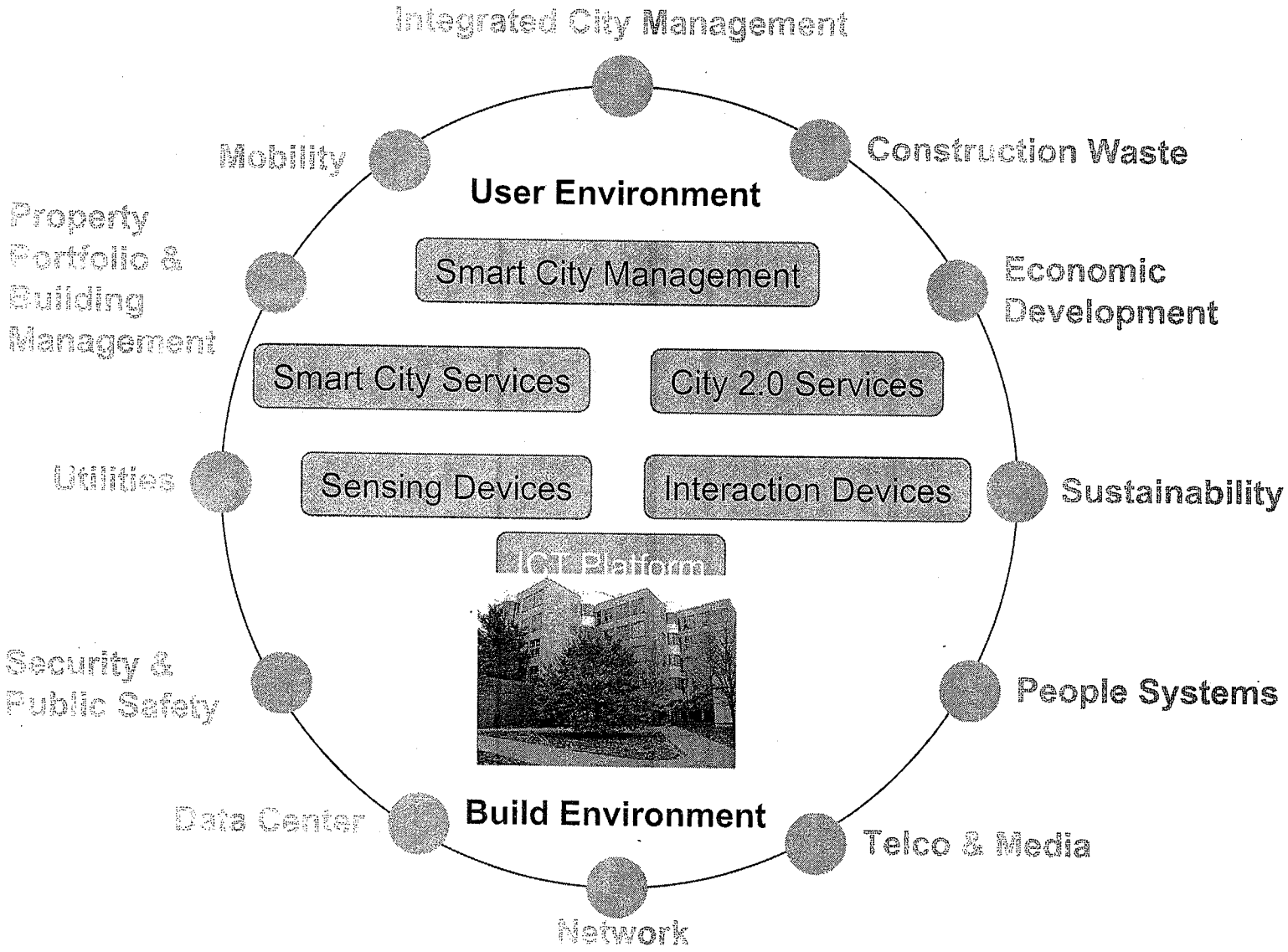
Source: Various; IBM MI Analysis

There are many different visions of what a "smart city" is…

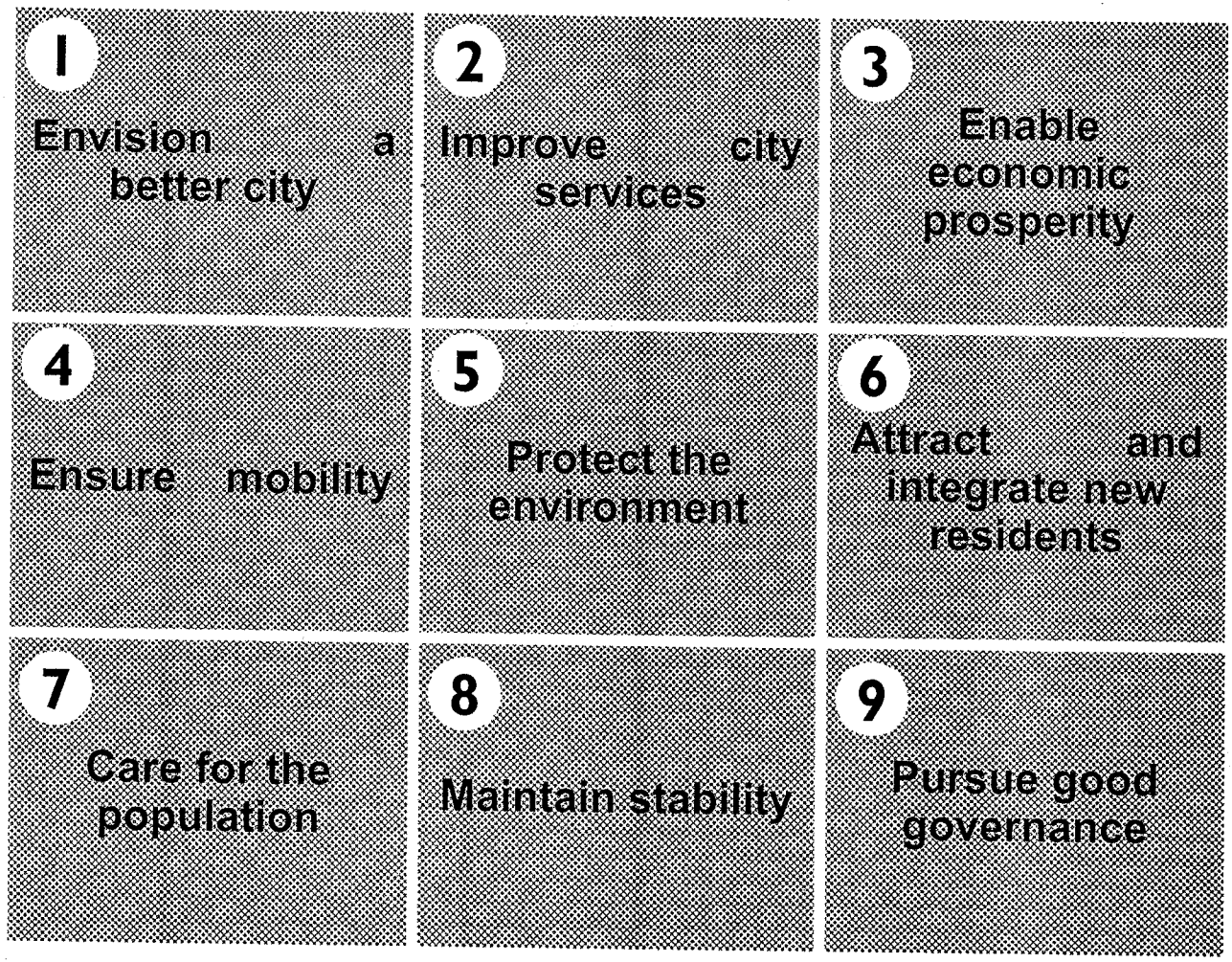






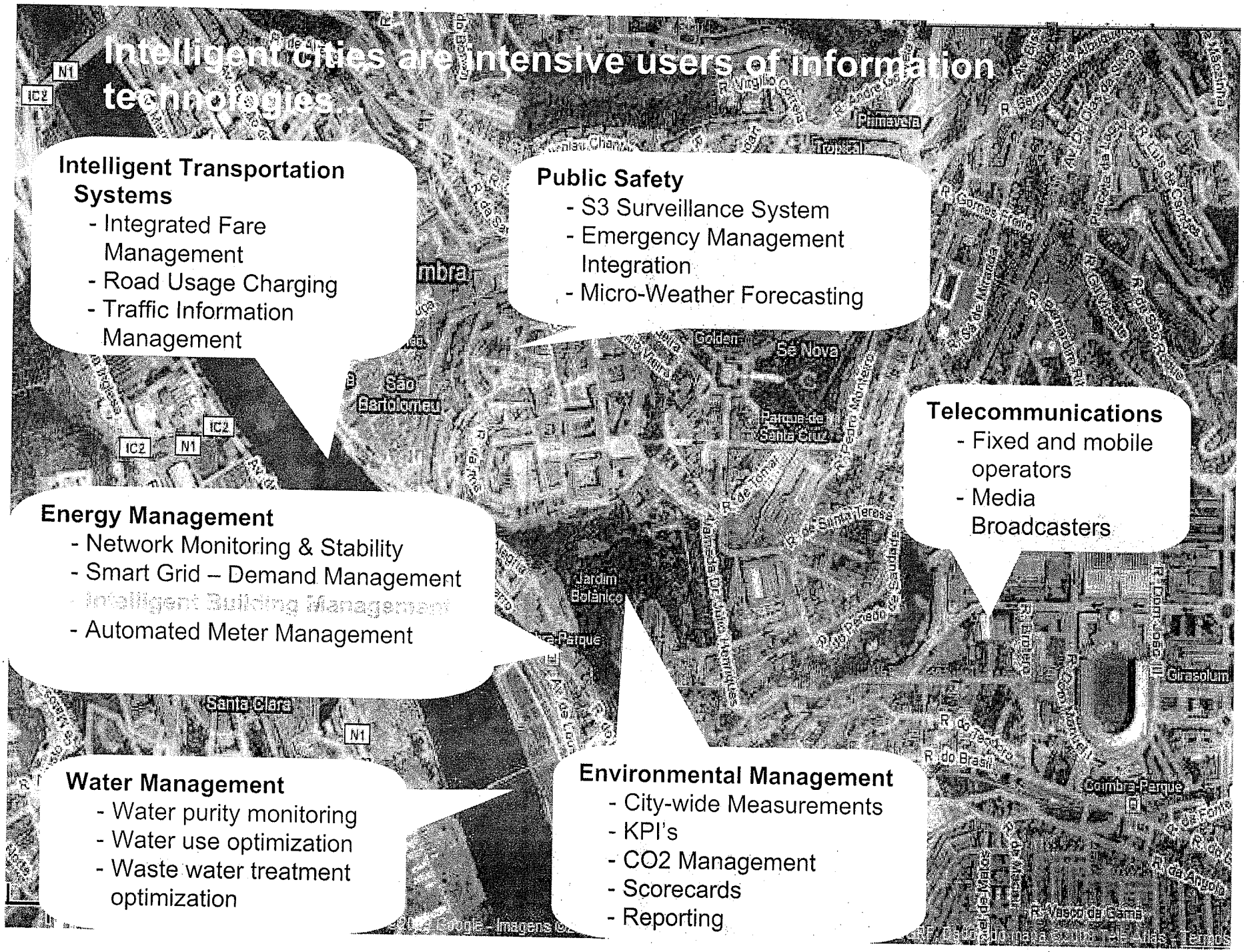

Integrated City Management
Mobility
Construction Waste
User Environment
Property Portfolio & Building Management
Smart City Management
Economic Development
Smart City Services
City 2.0 Services
Utilities
Sensing Devices
Interaction Devices
Sustainability
ICT Platform
Security & Public Safety
People Systems
Data Center
Build Environment
Telco & Media
Network

Urban Needs Matrix



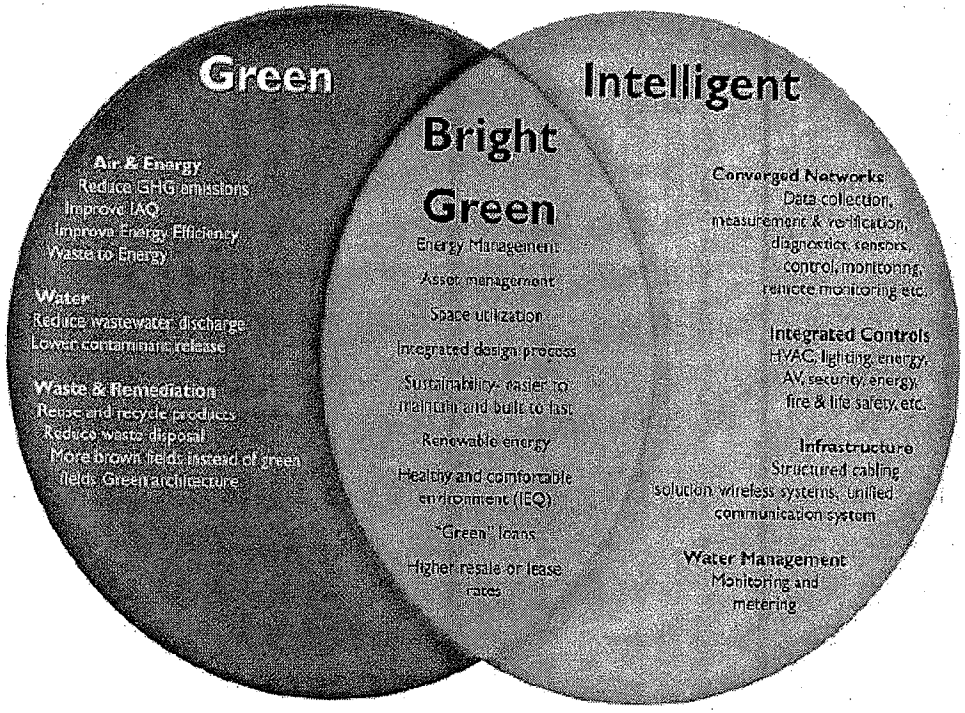
There are many challenges and ambitions driving the growth and transformation of cities...

Envision a better city	Development of long-term plans for the city – the city has a strategic vision; can meet the needs of future generations	*PLANYC 2030*
Improve city services	Better both the performance and reliability of city services based on metrics; simplify and integrate access to services	*Cairo, Egypt*
Enable economic prosperity	Effectively compete for investment – create an attractive place for business; pursue inclusive, productive and sustainable growth	*Kobe, Japan*
Ensure mobility	Guarantee free movement to, and around, the city; congestion is actively managed and minimized (road, air, pedestrian, bike, etc.)	*Hong Kong MTR*
Protect the environment	City operates in a sustainable manner; energy is generated cleanly, used efficiently and priced fairly; eliminate pollution	*Vancouver, Canada*
Attract and integrate new residents	Actively compete for talent; be a desirable place to relocate to; anticipate and accommodate shifts in population and demographics	*Mumbai, India*
Care for the population	Permanent and temporary residents, visitors and tourists are safe and secure; there are interesting places to go and things to do	*Vienna, Austria*
Maintain stability	Physical infrastructure is safe, reliable and doesn't exceed capacity; the city is fiscally stable; the city is resilient in the face of disaster	*New Orleans, U.S.*
Pursue good governance	Participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive	*Stockholm, Sweden*


Intelligent cities are intensive users of information technologies...
Intelligent Transportation Systems
- Integrated Fare Management
- Road Usage Charging
- Traffic Information Management
Public Safety
- S3 Surveillance System
- Emergency Management Integration
- Micro-Weather Forecasting
Telecommunications
- Fixed and mobile operators
- Media Broadcasters
Energy Management
- Network Monitoring & Stability
- Smart Grid – Demand Management
- Intelligent Building Management
- Automated Meter Management
Water Management
- Water purity monitoring
- Water use optimization
- Waste water treatment optimization
Environmental Management
- City-wide Measurements
- KPI's
- CO2 Management
- Scorecards
- Reporting

Smarter buildings leverage green buildings and automation systems achieving numerous financial, environmental, and efficiency benefits

Bright Green Buildings – The Convergence of Green and Intelligent Buildings



- **Smarter buildings successfully** *merge building management and IT systems*
- **"Bright green buildings" (Intelligent Buildings) converge data, voice, and video with security, HVAC, lighting, and other electronic controls on a single network platform**
- **Intelligent buildings require integration of more than just traditional building systems:** *They demand a new approach to design and construction*

Source: CABA; IBM Corporate Market Insights Analysis

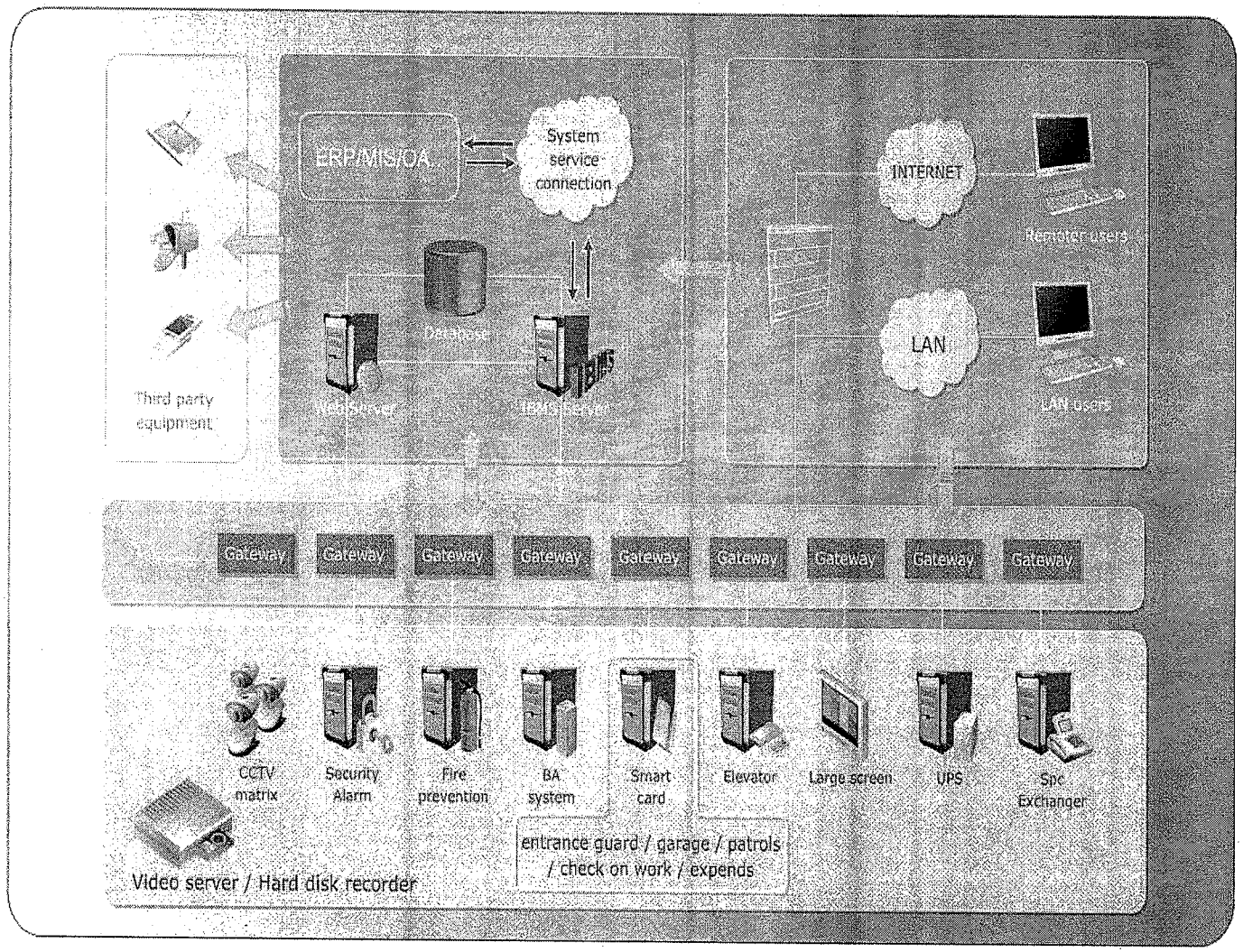
Smarter building definition

- "Smarter buildings" integrate and optimize the physical and digital infrastructures in individual buildings and groups of buildings to create facilities that are:
  - More cost effective for its owners – reducing energy and operational costs
  - More operationally efficient
  - Comfortable and productive for its occupants
  - Safer and more secure
  - Environmentally responsible for the planet

Smarter Buildings – IBM Innovations and Sustained Value Add

- **Smart Building to Smart Grid Integration**
  - Leverage IBM leadership in Smart Grid to optimize energy efficiency and energy cost reduction for smart buildings clients
- **Property Performance Management System based on Maximo Asset Management**
  - Provides energy, water, waste and emissions management across multiple properties, for energy efficiency and GHG emissions reduction.
- **Intelligent Building Management Systems in China - a partnering opportunity**
  - Integrate multiple sub-systems in a building to improve operational efficiency, reduce cost, and reduce GHG emissions
- **IT backbone value vs. BMS backbone**
  - Improve reliability and value for intelligent building management and property management systems

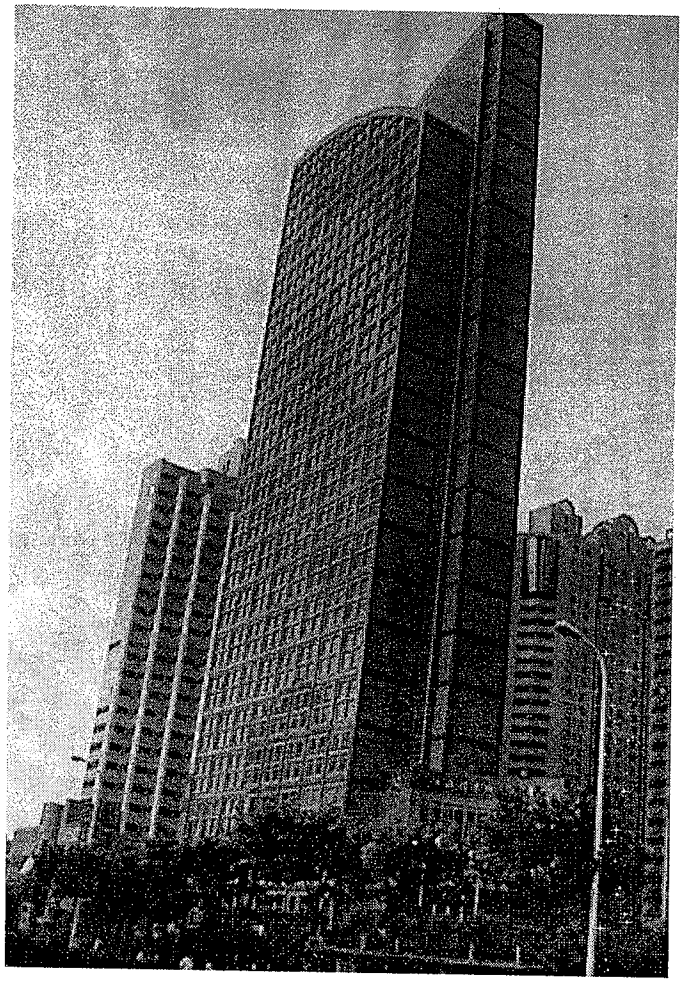
Intelligent Building Management System (IBMS) Architecture



Systems Integrated

1. Structured Cabling System
2. Network
3. PABX
4. Intelligent Wireless Communication System
5. Access Control System
6. CCTV
7. Patrol and Alarm
8. Parking Management
9. PAS (Background Sound)
10. CATV
11. Room Energy Saving System
12. BAS
13. IBMS
14. Property Management System
15. IT Room
16. Conference System

IBM Case Study – Intelligent Building – St. Regis Hotel Shanghai



- Only Intelligent Building among 33 five stars hotels in the region
- Designed at 5.1% energy cost to revenue, now at 4.9% ... all other 5 star hotels average 8%
- 40% reduced energy cost / revenue vs. other 5 Star hotels

Property Management Challenges

Property is frequently the 2nd largest individual item on a corporate balance sheet.

Corporate Challenges:

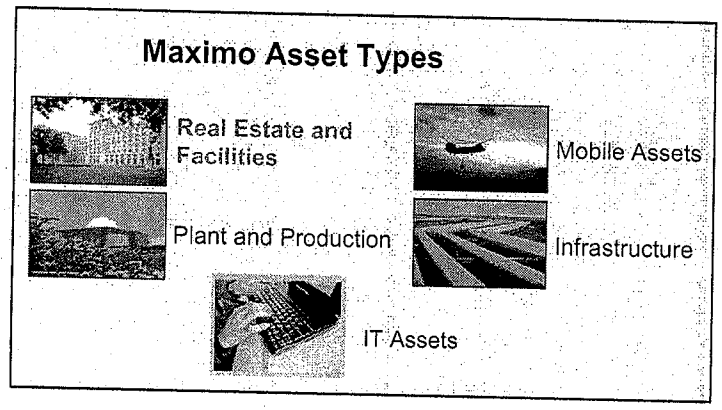
- ***Reduce property costs***
- ***Deliver more from property assets***

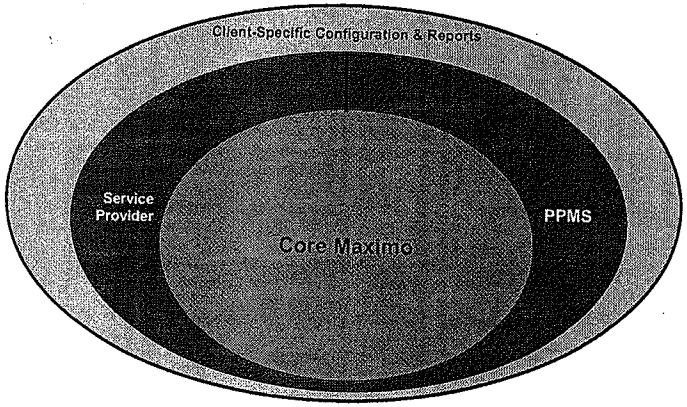
Property Management Responses:

- ***Make buildings more efficient… need 'smart' buildings***
- ***Centralise property organisations… need visibility***
- ***Use buildings more effectively… need effectiveness KPIs***
- ***Outsource the delivery of services… need consolidated data***

The Maximo Property Performance Management Solution (PPMS) is designed to help Property Management organisations deliver against these challenges

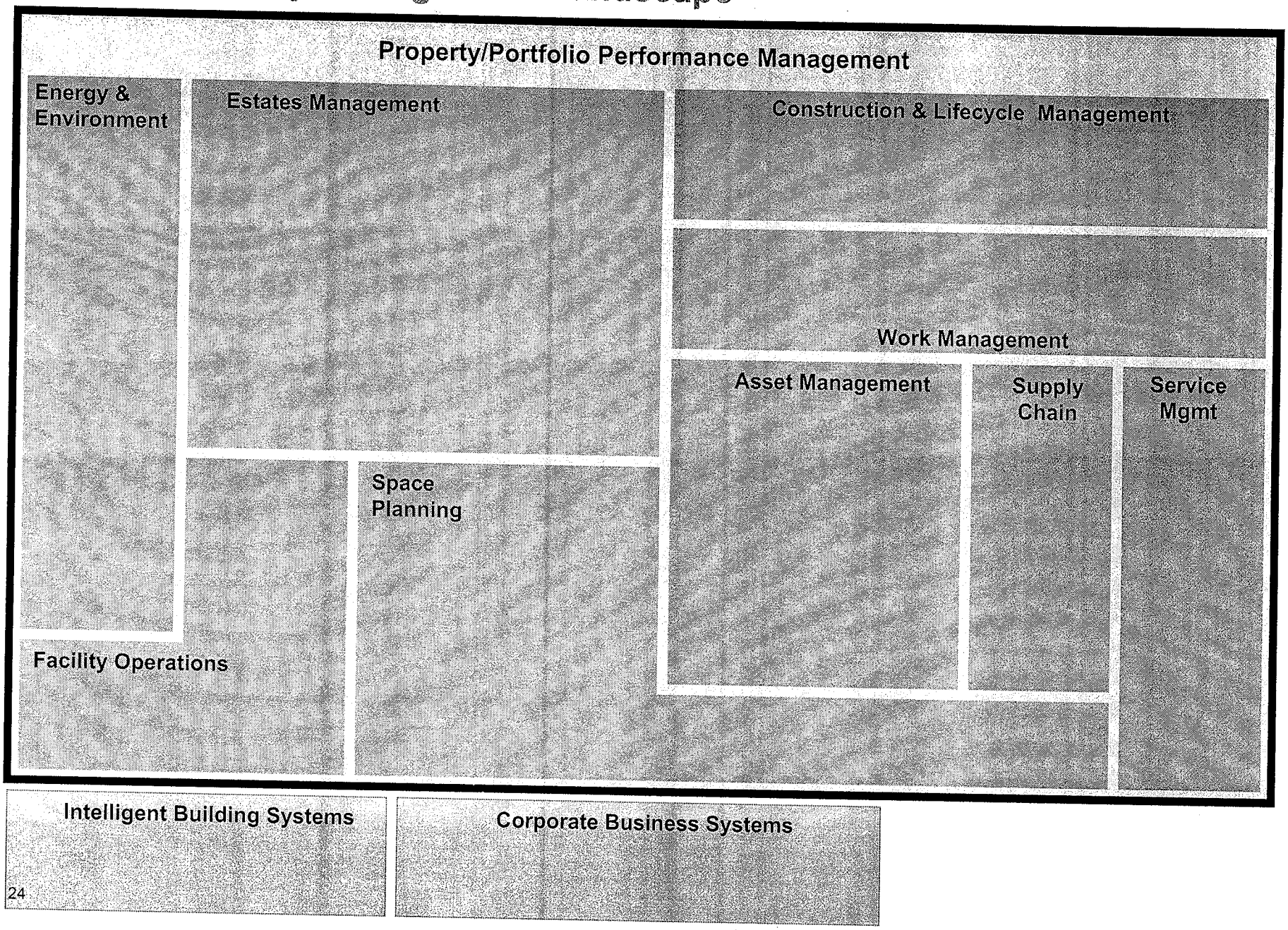
The IBM Maximo Solution Set for Facilities





- 'Core' Maximo
  - Covers asset and work management for all physical assets
  - For 'self-delivery' – ie need to control own assets and deliver work using own staff
- Maximo Service Provider
  - Industry Vertical for 'providers' who deliver services to others
  - Allows the provider to use same staff on multiple contracts & to manage the SLAs, time allocation and billing across the multiple contracts
  - Asset and work focussed (mainly maintenance)
- Maximo Property Performance Management Solution (PPMS)
  - A GBS 'Accelerator' - adds new fields, screens & reports to core Maximo
  - Aimed at large occupiers who have a large portfolio of property and use service providers (as above) to deliver services. The providers will commonly use their own systems – PPMS enables key data to be extracted from those systems and consolidated in Maximo.
  - Property focussed – much wider scope than maintenance

IBM's Property Management Landscape



IBM Routemap for Facilities

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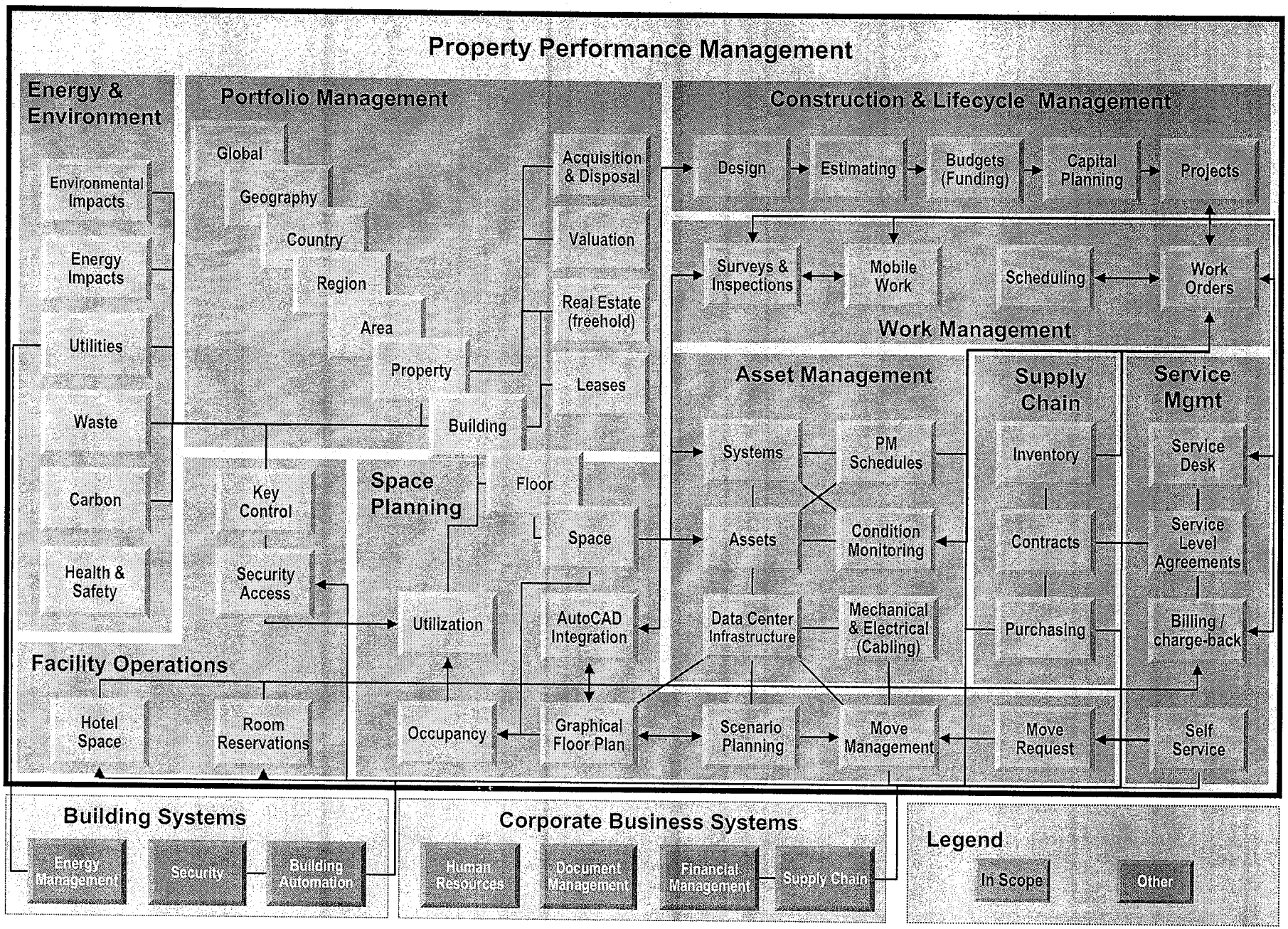
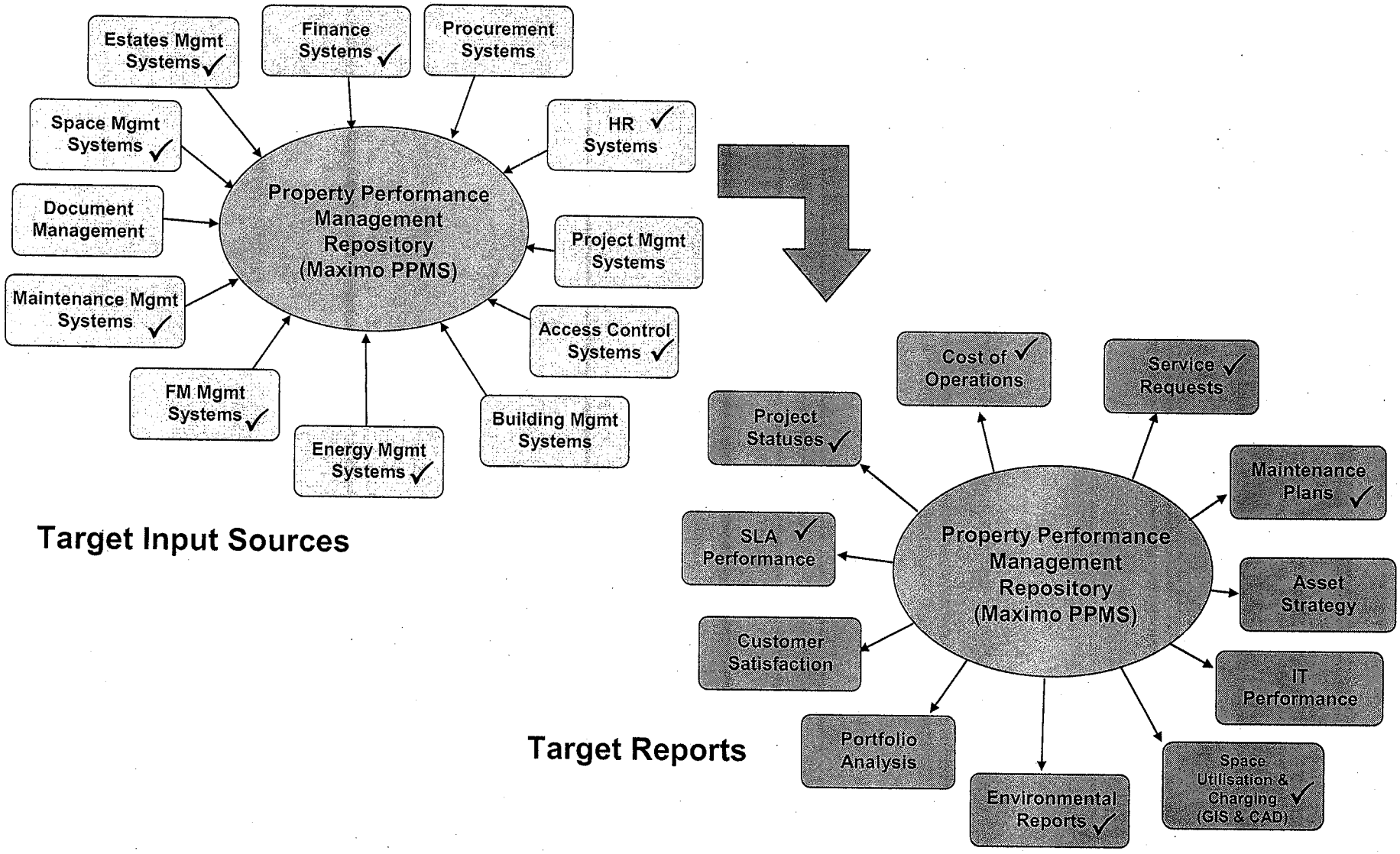
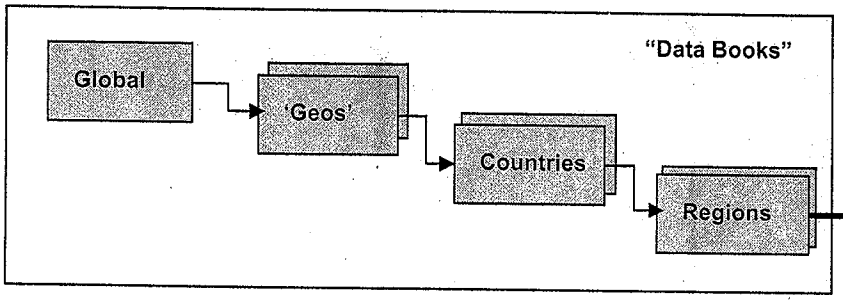


Connectivity – Data From Multiple Source Systems



IBM Maximo PPMS Overview



Some Statistics:
- 186 objects in 27 custom apps
- 44 tables and 85 views
- 240 reports
- 40Mb of demo data

Roles
- Area Estates Manager
- Area Facilities Manager
- Area Environmental Manager
- Area Projects Manager

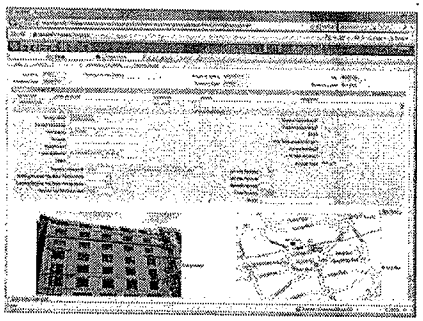
Areas

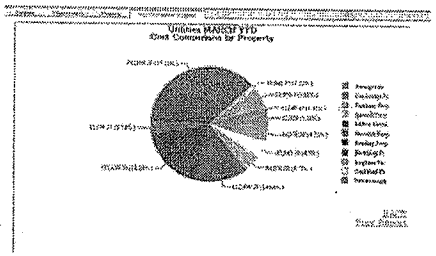
Properties

"Property Level Roles"
- Property Estates Manager
- Property Facilities Manager
  - Property Space Manager
- Property Environmental Manager
  - Property Utilities Manager
  - Property Waste Manager
- Property Projects Manager

Buildings

Land





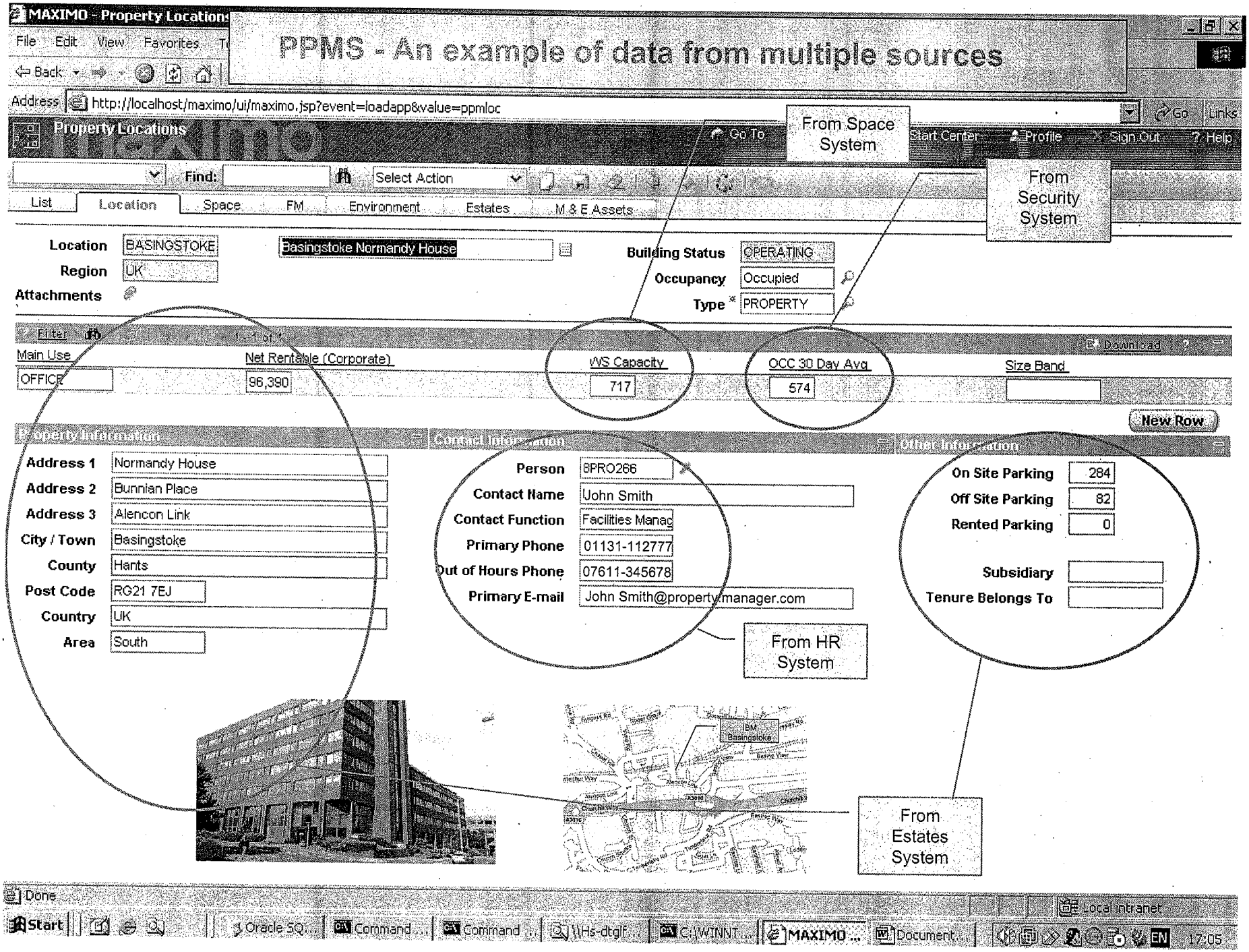
Estates Manager
- Portfolio List
- Acquisitions
- Disposals
- Real Estate (Freeholds)
- Leases
- Valuations
- GIS

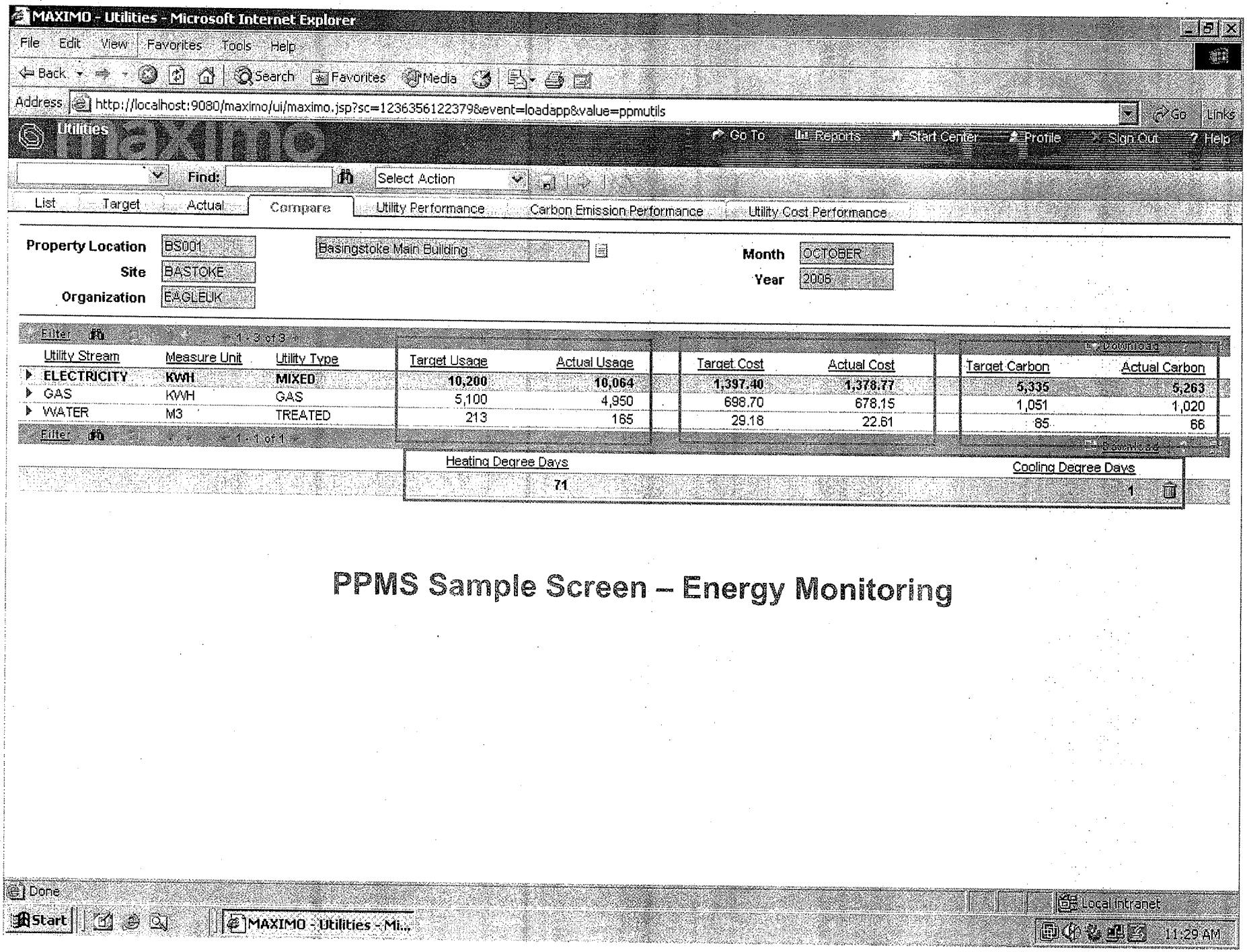
Facilities Manager
- Assets
- Surveys
- Work
- Help Desk
- Operations
- Space
- Occupancy

Environmental Manager
- Environmental Impacts
- Energy Impacts
- Utilities
- Waste
- Carbon
- Health & Safety

Projects Manager
- Design
- Budgets
- Planning
- Project Progress
- Projects Costs

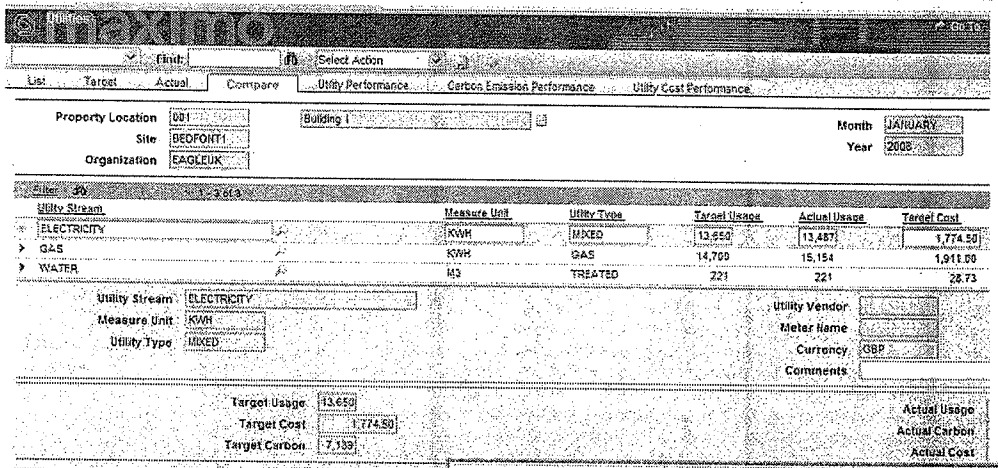
PPMS - An example of data from multiple sources

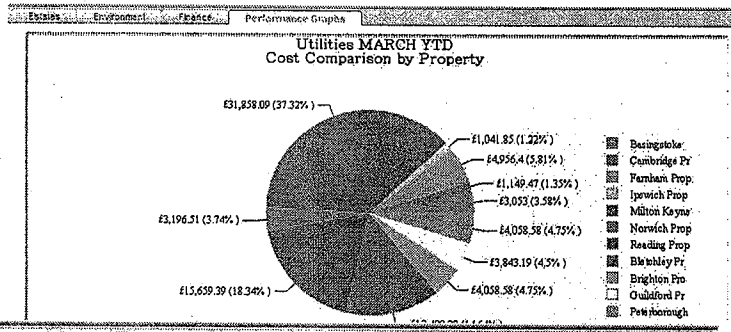




PPMS Sample Screen – Energy Monitoring

PPMS - A selection of ways to view data





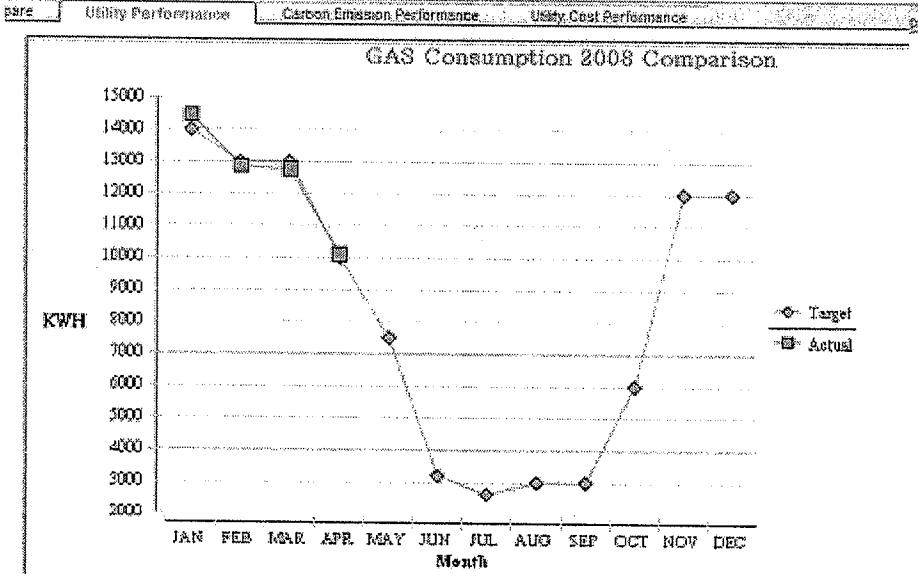
Utility Consumption Status Report

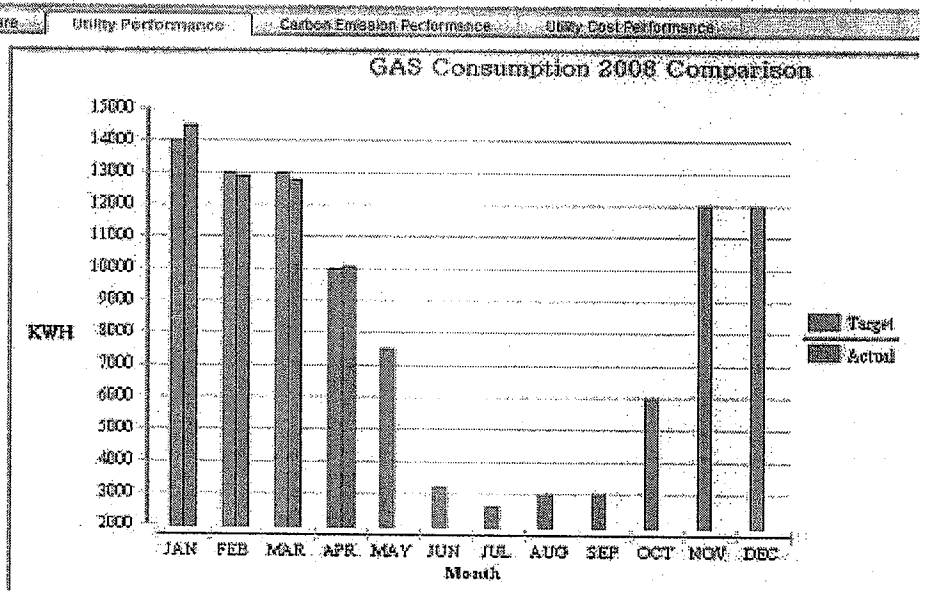
Location : BS001
Site : BASTOKE

Month : SEPTEMBER
Year : 2008

Utility	Measurement Unit	Utility Type	Target Usage	Actual Usage	YTD Target	YTD Actual
GAS	KWH	GAS	2550	2448	58905	58682
WATER	M3	TREATED	213	169	1583	1482
ELECTRICITY	KWH	MIXED	10200	10468	80750	86527

Print Report





The Benefits that IBM has Harvested from this PPMS Approach

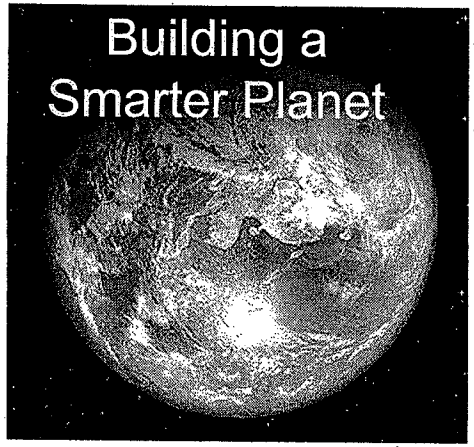
- The ability to grow the system based on day-to-day operational user feedback. It has grown organically out of the need to solve real business problems, rather than as a marketing exercise to increase the capabilities of a system.
- The ability to look at the whole portfolio, combining data from all property activities (estates, FM and projects); and from elsewhere in IBM (such as HR, finance and operations).
- Improved access (600+ users across 10 countries) using common and consistent aggregated data which has improved decision making.
- In-house users see information at the 'performance management' level and do not get involved in individual incidents unless there is a serious problem. For example, IBM now needs only 3 in-house staff to manage all of their UK FM services.
- Improved visibility (such as the ability to match IBM financial system records with supplier work orders) and thus enforce tighter Business Control where this is necessary.
- Reduced duplication of effort, data and resource and streamlined processes.
- A flexible, responsive mechanism to be able to take on additional property and services (a frequent occurrence given the number of acquisitions IBM makes globally).
- Data definition and ownership is now back in-house, without duplicating the suppliers' activities or systems. IBM's critical property data is protected.
- Having its key data under its own control has given IBM the information and flexibility to be able to alter its supplier base with the knowledge that it understands its assets, the performance of its portfolio and what it needs to get out of that portfolio. This information can be passed on to bidders to enable them to make better informed, and thereby more cost-effective, bids. New suppliers do not have individual systems mandated upon them, but they are required to meet data transfer standards.

Maximo PPMS as Part of IBM's Smarter Planet Vision

The world is flatter.

The world is smaller

The world is getting smarter.



Because it can.

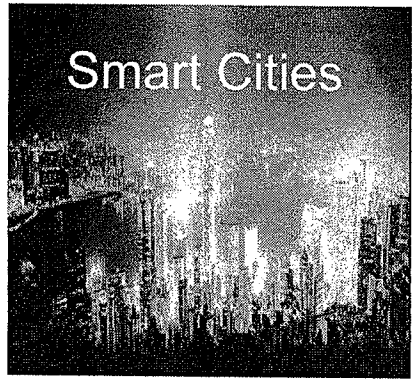
Because it must.

Because we want it to.

Everything is becoming *Instrumented*

Everything is becoming *Interconnected*

Everything is becoming *Intelligent*



Smart Grid ⟺ **Smarter Buildings**

Maximo (PPMS)

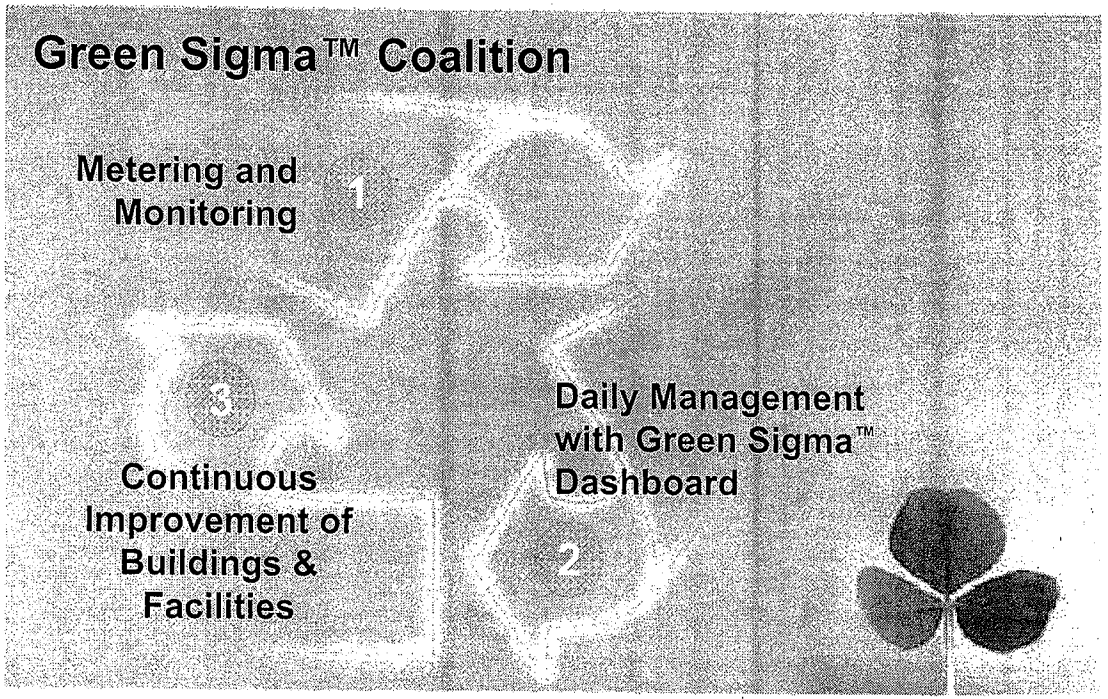
Enterprise
Dashboards
Business Integration
Enterprise Management

Finance
Estates Mgmt
Projects
Facilities Management

Systems Integration
User Interface
Integration
Optimization
On-site & remote Operations

Building Systems
HVAC
Lighting
Fire and Safety
Security
Access
Energy Metering
Water
High Speed Internet and Networking
IP Telephony, Digital TV
Data Center
Elevators and Escalators
Parking

EATON Powering Business Worldwide · SIEMENS · Honeywell · Schneider Electric · ESS · cisco · Johnson Controls · SAP



Accelerating the move toward sustainable enterprises

Implementing high value projects that drive quick ROI

Enabling enterprises everywhere to reduce energy, water, waste and GHG Emissions…

Smarter companies working together to co-create a Smarter Planet, Smarter Cities and Smarter Buildings – today

IBM is uniquely positioned to deliver value … and partner with governments in executing their green agendas.

Energy resources are constrained. Shortages are emerging in capacity for public infrastructures for power, water and transportation. There is strong demand for improved energy efficiency, especially in data centers. These mark a large and permanent shift in the global economy.

- **Carbon management is a boardroom issue, with a wide gap existing between organizational rhetoric and actions**
- **Governments, businesses and consumers are unclear about actions to take for energy savings and reduced greenhouse gas emissions**
- **Future investments will be a combination of redirected budgets and new investments**
- **Adoption increases when there are measurable cost savings for transforming the use of energy and water**

IBM brings great value to clients worldwide through:

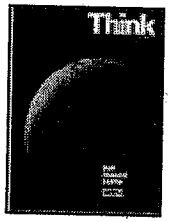
- *Consulting, systems integration, data analytics*
- *Highly secure and resilient systems*
- *Leverage of IBM internal energy best practices*

IBM has a long history of environmental tradition and leadership.

1976: Think!, the company magazine, devoted an entire issue to IBM's energy conservation and environmental programs

1971: T. J. Watson Jr. issued IBM's first corporate policy on environmental protection

1989: IBM offers its first product take-back program



1990: Think! Devoted an entire issue to IBM's environmental programs – beginning IBM's annual Corporate Environmental Reporting

1991: Established IBM's Product Stewardship Program

1992: IBM becomes charter member of Energy Star Program

1994: Established Global Materials Recovery Center Network for product re-use and recycling

1997: IBM becomes the first major multi-national to earn a single global registration to the ISO 14001 environmental management system standard

44% **1990 - 2006:** Between 1990 and 2006, IBM's global energy conservation actions **reduced or avoided CO_2 emissions equal to 44% of its 1990 emissions**

95% **1987 - 2006:** Reduction in hazardous waste generation since the 1987 base year of this pollution prevention metric

96% **2006:** Amount of IT product and product waste processed by IBM's product End-of-Life Management operations that was **reused or recycled**

2006: IBMers "Jam" on innovation for a better planet, and IBM invests in Big Green Innovations

2007: Invested in Intelligent Utility Networks, Intelligent Transportation Systems, Project Big Green

Collaborating to develop solutions ...

GRIDWISE

the green grid

climate counts

WWF

WORLD RESOURCES INSTITUTE

CLIMATE LEADERS

The Nature Conservancy

blade.org

IBM Public Sector Energy and Environment Diagnostic

Overview

IBM can help government agencies and organizations better understand their overall energy and environmental performance using the IBM Public Sector Energy and Environment Diagnostic ("the Diagnostic"). IBM can help organizations define a new strategy to meet the public demand for essential improvements in energy usage and environmental impact.

How the Diagnostic Works

IBM consultants work with you and your organization to evaluate energy and environmental strategies and programs. Using the following categories, IBM consultants use the Diagnostic to identify the current level of performance as well as areas needing improvement:

- Environmental Management Systems – managing program and progress
- Energy and Greenhouse Gases – energy efficiency and renewable sources
- Water Management – consumption and quality
- Waste and Disposal – waste prevention, recycling, environmentally responsible disposal
- Facilities and Equipment – motor fleets, renovation, and construction
- Workforce Programs – sustainability programs, training, benefits, and awards for environmental sustainability leadership.

Based on IBM's Component Business Model approach, the Diagnostic tool breaks organizations into logical areas of sustainability opportunities within an organization, and then evaluates areas for compliance and efficiency opportunities Areas for potential environmental improvement are then prioritized. The priorities are used to develop a comprehensive strategy for implementing those changes, along with an accounting of the cost and benefit of each solution.

What's Next

The Public Sector Diagnostic is designed for the development of an energy and environmental strategy. Once the initial analysis is complete, government agencies can use other IBM solutions like Green Sigma™ to measure and monitor energy and water usage throughout an organization's operations, and the Carbon Trade-off Modeler, which helps evaluate and balance carbon dioxide emissions and energy usage with other key factors throughout a supply chain.

Other IBM Green Offerings

The Public Sector Energy and Environment Diagnostic joins a growing portfolio of consulting offerings from IBM designed to help clients address Corporate Social Responsibility (CSR) issues throughout operations, including:

- CSR Assessment and Benchmarking Utility
- Carbon Tradeoff Modeler
- Green Sigma™
- Environmental Product Lifecycle Management
- Supply Chain Network Optimization Workbench (or SNOW)
- Strategic Carbon Management.

For More Information

IBM is committed to environmental leadership in all of its business activities. For further information, please visit: **ibm.com**/green

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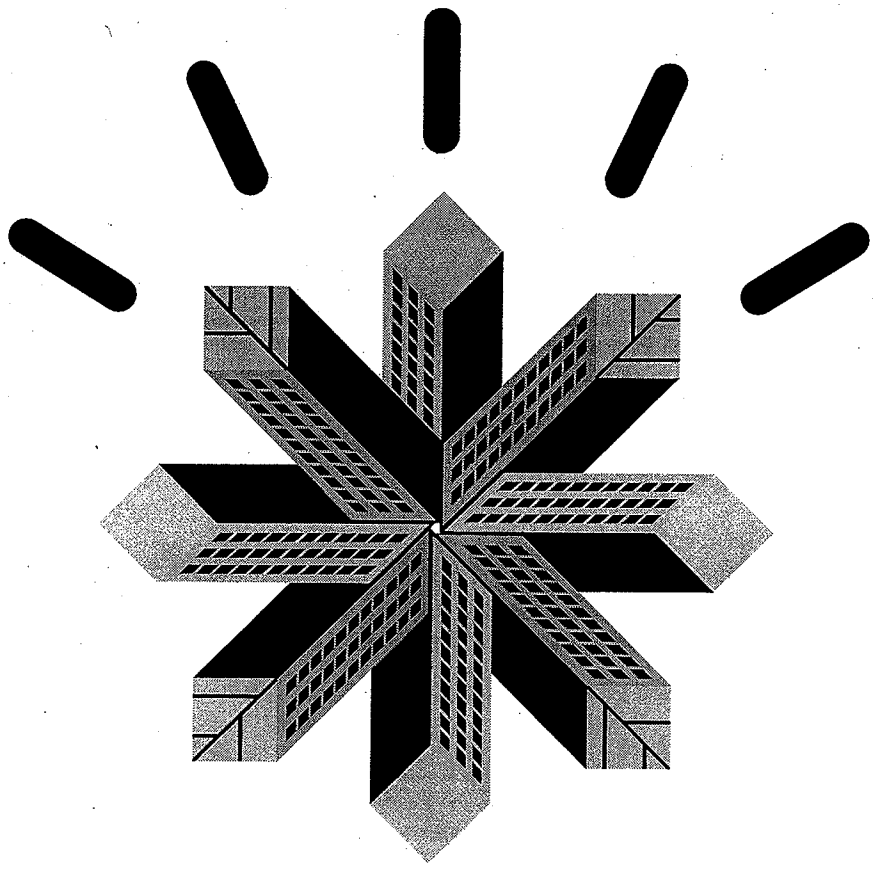
Conversations for a Smarter Planet: 16 in a Series



Constructing a smarter planet, one building at a time.

Buildings have always been much more than roofs over our heads. Over the last century, as towers of steel reached higher into the sky and homes sprawled farther and farther into the surrounding landscape, our buildings not only housed burgeoning urban populations and growing economies–they also served as symbols of modernity and progress.

Unfortunately, today's offices, factories, stores and homes are also symbols of something else–waste and pollution. In the U.S., buildings consume 70% of all electricity, up to 50% of which is wasted. Lights blaze and air conditioners hum in empty offices at night, and lawn sprinklers turn on even during a rainstorm. Commercial buildings lose as much as 50% of the water that flows into them. By 2025, buildings will be the single largest energy consumers and emitters of greenhouse gasses on our planet.

But on a smarter planet we can think about buildings differently–seeing homes not just as living spaces, but as living systems; seeing offices not just as static structures where work is done, but as manifestations of all the ways the world works.

In a smart building, systems are not managed separately–they interoperate. Thousands of sensors can monitor everything from motion and temperature to humidity, precipitation, occupancy and light. The building doesn't just coexist with nature–it harnesses it. Smart buildings can reduce energy consumption and CO_2 emissions by 50% to 70% and save 30% to 50% in water usage.

Although today most attention is focused on smart homes, some of the most dramatic progress is being achieved in commercial developments around the world. The St. Regis hotel in Shanghai integrated 12 subsystems to create one intelligent building, with a ratio of energy costs to revenue below 5% (compared to 8% for other five-star hotels). GIB-Services in Switzerland is using excess heat from its datacenter to heat a local public swimming pool. A mining company in Canada is using its excess datacenter heat to warm its warehouses during the cold Canadian winters. IBM's own green datacenter in Boulder, Colorado, has replaced energy-greedy air-conditioning with cooling from the air outside, which can be used for up to 75% of the year, contributing up to 50% in annual energy savings.

And for a glimpse of what is possible through a smarter approach, consider the GreenSpaces office park in Delhi, India, on which construction will begin this year. It aims to be the world's greenest and most energy-efficient commercial building, through such innovations as 100% waste and water reclamation, instrumentation and interconnection of all systems, recharging ports for electric cars, and ventilated chairs. It even plans to "grow" its own oxygen and remove harmful compounds from the air through the strategic use of indoor vegetation–which doesn't just help the environment; it also helps people think and be more productive. An earlier prototype was rated the healthiest building in Delhi by the Indian government.

In the 20th century, people marveled at what could be built by filling our buildings with steel. In the 21st, let's see what new heights–and reduced footprints–we can achieve by filling them with intelligence. Let's build a smarter planet. Join us and see what others are thinking at **ibm.com**/think

THINK

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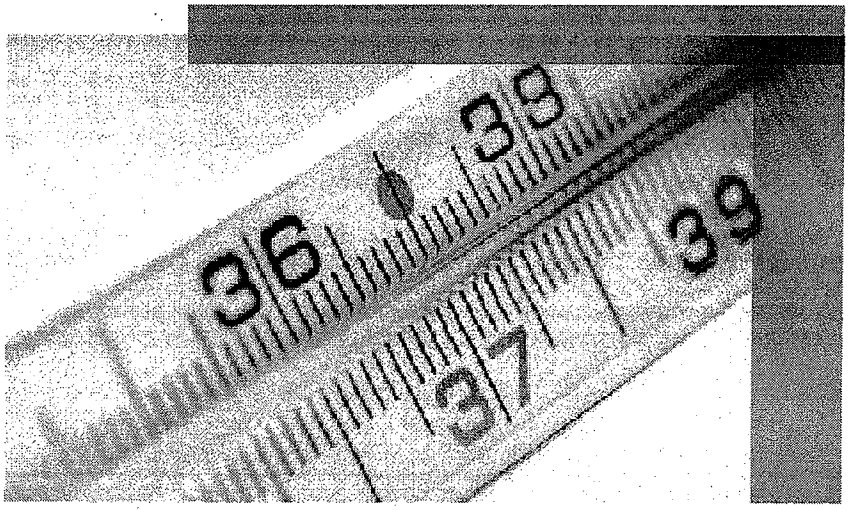
IBM Green Sigma™

How to reduce your environmental impact through Green Sigma™



What's driving organizations to act?

Increasing regulatory pressures, the focus on corporate social responsibility, rising energy costs and new opportunities are forcing companies to reassess the impact of environmental issues and energy use on their business bottom line.

All over the world, new or pending national and regional laws relating to carbon emissions and other environmental issues are going to seriously affect how companies operate in the future. Mandatory carbon reductions or Cap and Trade programs will impose real change. There is no doubt: the only debate is how much new regulation and how soon will it take effect.

At the same time, energy costs are on the rise as growing world-wide demand inevitably encounters a finite source of fossil fuels. New sources of energy, some say renewable, will be needed but are years away from making significant impact on the supply/demand balance

As a result, the need for green initiatives is growing rapidly as businesses and consumers place the environment and energy costs on the agenda.

The organization's carbon footprint is an economic incentive to manage carbon output more efficiently. This will grow with the increasing maturity of 'cap and trade' systems around the world.

As a company committed to protecting the environment for more than three decades, IBM is presenting Green Sigma™ in response to these drivers. This is a new solution offering, which merges IBM's deep expertise in Lean Six Sigma with other robust green initiatives, resources and intellectual capital across the company.

Defining key performance indicators (KPIs), and setting up suitably accurate monitoring capabilities in the targeted green focus area is key to assessing an organization's current position. **"If you can't measure it, you can't manage it."**

Once KPI monitoring is in place, ongoing control of the operational environment will not only ensure continued compliance, but will also act as a launchpad for future process improvements and cost savings initiatives. For example, having accurate and measurable KPI data readily available will make actual gains easy to demonstrate.

In summary, the value of improving carbon management and pursuing a Green Sigma™ solution includes:

- Managing and reducing the organization's carbon footprint
- Improving shareholder value by reducing overall energy, water consumption, waste creation and their associated costs
- Establishing ongoing control and management of the organizations environmental footprint through the use of advanced statistical techniques and tracking on a portal-based console and IT repository
- Increasing profit opportunity through potential carbon trading and by catalyzing other process improvements

What's the solution?

Green Sigma™ leverages the foundation of Lean Six Sigma tailored to achieve specific environmental and business goals, while at the same time improving ROI. Some specific extensions Green Sigma™ adds to Lean Six Sigma include:

- Green key performance indicators related to both direct and indirect emissions: energy usage, business mileage, logistics carbon footprinting, vendor management and compliance
- Green Sigma™ Console based on green key performance indicators tailored to each client

- Carbon value stream mapping and other applied statistical techniques to optimize energy, water or waste performance and thereby achieve cost reduction and/or process improvements
- Voice of the Environment, a technique that identifies the environmental priorities not captured in Voice of the Customer or Process

How to get started?
Green Sigma™ engagements begin with an assessment tool such as carbon management value stream analysis, component business modeling or energy assessment reviews. Once a baseline is established, clients have a clearer view of which critical areas to explore for deeper analysis.

Following the initial assessment, IBM continues to partner with each client to develop a tailored carbon management solution using Green Sigma™. The phases below describe a high-level framework for a Green Sigma™ engagement.

Phase I: Define Key Performance Indicators

A set of client carbon KPIs is defined and tailored to the client's environment, industry and business. Activities include building a carbon key process indicator set including regulatory and stakeholder requirements.

Phase II: Establish Metering and Baseline

Identify and advise which areas to deploy suitable metering in order to track and establish a set of carbon KPI baselines, which in turn are used to identify opportunities for improvement. This phase can also include the development of a facilities management plan, sensor deployment strategy and technical infrastructure requirements.

Phase III: Deploy Green Sigma™ Reporting

Deploy a portal-based Green Management and Reporting system to display KPI, metering data and other critical data outputs. This can link into the physical network infrastructure as well as initiate triggers for carbon trading.

Phase IV: Optimize Processes

Use applied Green Sigma™ statistical tools and experimental design techniques to analyze, improve and optimize processes which impact areas of high energy use, water use, waste creation or high carbon output.

Phase V: Control performance

Green Sigma™ consultants work with the client team to establish ongoing optimization of core processes and KPIs. Critical control factors, with control limits identified in the optimization stage, are deployed on the Green Sigma™ Console for ongoing monitoring and control. Opportunities for replication and standardization of opportunities and processes are applied across the enterprise to further leverage benefits of a Green Sigma™ investment.

The goal with the Green Sigma™ offering is to partner with clients to drive innovation, achieving economic benefits for the business and reducing the impact on the environment.

IBM is committed to environmental leadership in all of its business activities. For further information see ibm.com/ibm/environment.

International Business Machines Corp
1 New Orchard Road
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10504

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To find out more, please contact one of these people or speak to your IBM representative.

Contact details
Monica Painter
monica.painter@us.ibm.com

David Lubowe
dave.lubowe@us.ibm.com

January 2009

Tivoli. software

Implement an energy dashboard to communicate performance and deliver operational insight

Highlights

- ***Implement a role-based, customizable energy dashboard for holistic views of energy consumption across the infrastructure***
- ***Communicate executive-level and operational insight regarding energy usage and events across IT, facilities and physical assets***
- ***Include the power infrastructure and energy and thermal metrics into your business service model***
- ***Use drill-down views to make informed decisions to reduce energy costs while preserving service levels***
- ***Use the energy dashboard and underlying information as the foundation to support other energy optimization initiatives***

Most organizations today are being asked to monitor and manage their energy consumption, yet are challenged to convey how their efforts might lead to greater efficiencies and cost savings. Energy information is often scattered across spreadsheets, power bills and reports, and is therefore usually not correlated with service delivery. The infrastructure is often complex, and cross-infrastructure views and metrics simply do not exist.

To demonstrate leadership and alignment with your corporate sustainability objectives, you need a way to communicate current and past energy and thermal performance in business terms. You must be able to demonstrate positive impact on energy consumption, both to internal and external

stakeholders, through metrics and key performance indicators (KPIs). You need to be able to answer questions like:

- *How much energy am I using?*
- *What services are costing the most in energy consumption?*
- *Can I make alterations and still meet my service level agreements?*
- *Since we made changes, how much are we saving on energy bills?*

In order to do this, you must be able to monitor energy and thermal information across three key domains:

- ***The IT infrastructure,*** *including IT assets such as servers, storage and network devices*
- ***The facilities and property infrastructure,*** *including uninterruptible power sources (UPSs); power distribution units (PDUs); computer room air conditioning (CRAC) units; heating, ventilating and air conditioning (HVAC) units; chillers; lighting; security and fire systems*
- ***Assets,*** *including specialized assets like cell towers, manufacturing floor equipment, and trucking fleets or any physical business asset that consumes energy and can be managed for efficiency*

Manage energy usage by implementing an energy dashboard

To help organizations develop a comprehensive plan for energy management across the three domains, IBM has developed an energy management adoption model comprised of four management disciplines: discover, manage, optimize and report. Discovery is often the starting point for organizations that want to measure, collect and benchmark energy and thermal information and to identify opportunities for cost reduction and greater efficiencies.

Effective energy management involves using the information collected to monitor, trend and control energy usage in order to reduce costs and mitigate risks. For many organizations, a leading-practice energy management initiative includes implementing an energy dashboard—to communicate the ongoing economic and environmental impact of the infrastructure and to demonstrate how you are contributing to and supporting company-wide sustainability goals.

Choose your dashboard solution carefully

When selecting an energy dashboard, IBM recommends a solution that enables you to:

- *Consolidate a range of business and energy metrics into KPIs and financial terms.*
- *Convert energy consumption and savings into carbon footprint and monetary equivalents.*
- *Customize information displayed based on user requirements.*

The IBM energy dashboard delivers on these core capabilities.

Tie business services to infrastructure energy metrics

A versatile, role-based information dashboard that collects metrics from IT, facilities and physical assets, the IBM energy dashboard enables you to visualize and communicate both the environmental and economic impact of energy usage across your infrastructure. Using views from IBM Tivoli® Business Service Manager and drawing on information collected by IBM Tivoli Monitoring for Energy Management, and other potential sources, the IBM energy dashboard enables you to consolidate the information you collect and present it in an easy-to-read and insightful format.

Draw on a range of metrics

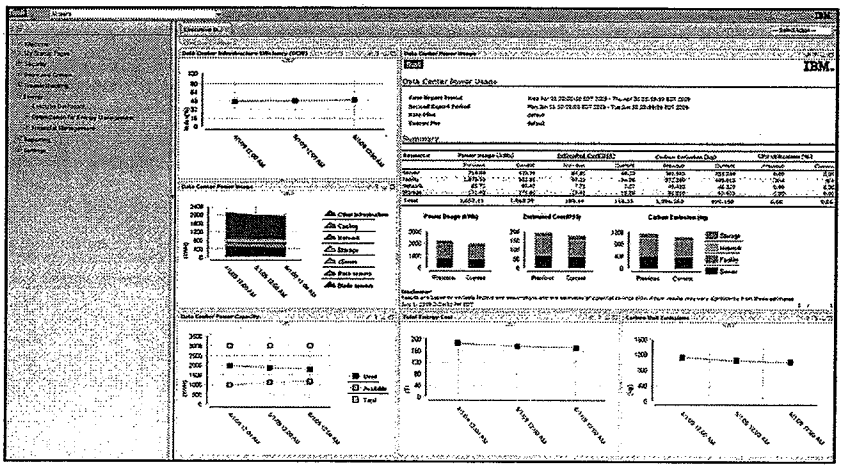
Everyone across your organization—from senior executives who want a broad view of energy usage across the organization to operations managers who are monitoring for service-related outages within the data center or facilities—can use the IBM energy dashboard to view information and metrics, including:

- *Data center infrastructure efficiency (DCIE).*
- *Power usage effectiveness (PUE).*
- *The data center carbon footprint.*
- *Energy consumption and cost comparisons across facilities.*
- *Relevant information from other, non-instrumented sources.*

With energy insight from across your infrastructure, you can make informed decisions about energy usage to reduce costs and prevent service-related issues.

Provide executive stakeholders and operations with insight and actionable information

Monitoring and managing IT, facilities and physical asset components for energy and thermal information involves much more than collecting data and presenting metrics. It requires action. Your organization needs alerts when energy- or thermal-related conditions require attention or have the potential to impact the performance or availability of a service or application.



Executive-level views in the IBM energy dashboard help you better understand the environmental and energy cost impact of your infrastructure and how your actions contribute to sustainability objectives.

With the IBM energy dashboard, energy and thermal metrics flow into a common event infrastructure—using Tivoli Business Service Manager—so that you can include them with traditional IT performance metrics and then process them using the same set of best practices used to manage IT performance today. What's more, because the dashboard is customizable, your operations team can use the metrics from data center and facilities components to prioritize events based on their impact to services, applications and service levels.

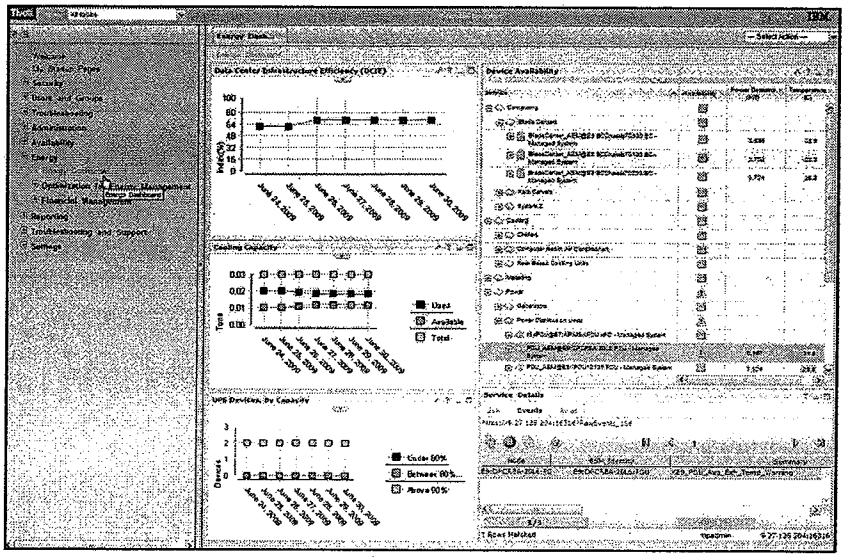
Flexibly leverage two dashboard views

The role-based IBM energy dashboard serves a dual purpose. First, it provides consolidated energy usage views for your executives and sustainability leaders. Second, it serves as a launch point for your operations team to drill into root-cause analysis and help take corrective actions.

- *Executive energy dashboard –This view enables you to visualize and communicate energy usage, the corresponding energy cost and environmental impact of the infrastructure and efficiencies achieved.*
- *Operations energy dashboard –The operations view helps predict and control energy usage and events. With this view, your operations team can use current and historical information to drill down and understand the causes of alerts and events, then generate a ticket to correct service-related issues.*

Preserve service levels and mitigate outage risks—only with IBM

While it is important to understand energy usage, it is equally critical to know how that usage actually affects your business services. Unlike other energy management solutions on the market today, IBM Service Management aligns your business services and your infrastructure for energy efficiency—providing both the insight and tools needed to identify issues or opportunities and take action in order to become substantially more energy-efficient.



Operations views in the IBM energy dashboard help you make informed decisions about potential service issues and mitigate outage risks.

IBM enables visibility into the energy usage of a broad range of infrastructure components and the relationship of your power infrastructure to the services they support. Once inefficiencies or problems are detected, your operations team can make informed decisions, like shifting workloads to reduce peak demand or avoid potential energy-related disruptions.

Manage energy beyond the data center

The IBM energy dashboard can also draw on information that goes beyond the walls of the datacenter—whether that involves presenting energy and thermal metrics from building infrastructure assets or pulling in other relevant information—so you can create custom views that are right for your organization. For instance, you can feed weather reports into your dashboard, and combine that with information on your infrastructure, to better understand how your assets and related services may be affected by naturally occurring events.

Optimize your infrastructure with IBM Service Management products

The IBM Service Management portfolio offers a variety of products that can help you assess the impact of energy optimization decisions on your service level agreements, transaction response times and other traditional performance metrics. You can also incorporate your energy dashboard into a comprehensive energy management strategy and use the insight and underlying information as the foundation for implementing other energy optimization projects, including:

- *Optimization of storage and data for energy efficiency.*
- *Financial accounting for energy.*
- *Condition-based maintenance of assets for energy efficiency.*
- *Alignment of cooling with load.*
- *Energy-aware scheduling and provisioning.*

Whether your IT organization is interested in measuring and benchmarking your energy consumption, or if you are ready to begin to identify opportunities and embark on an energy optimization project, IBM Service Management Solutions™ can help.